PRIMERGY TX200 S2 Server System

Operating Manual

Edition September 2005

Introduction

Installation Steps: Overview

Important Notes

Hardware Installation

Preparation for Use and Operation

Property and Data Protection

Troubleshooting and Tips

Hot-plug Components

Abbreviations, Related Publications and Index

Comments… Suggestions… Corrections…

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Certified documentation according to DIN EN ISO 9001:2000

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1 Introduction

The PRIMERGY TX200 S2 server is an Intel-based server for mid-size and large networks. The server is suitable for use as a file server and also as an application, information or Internet server. It is available as a floorstand or rack model. The floorstand model can be converted to a rack model using an optional conversion kit.

The PRIMERGY TX200 S2 server offers a high level of reliability and availability through highly developed hardware and software components. These include hot-plug hard disk drive modules and power supply units, optional redundant system fans, the *ServerView Suite* server management software, „Prefailure Detection and Analysing“ (PDA) and „Automatic Server Reconfiguration and Restart“ (ASR&R).

Security functions in the *BIOS Setup* and on the system board protect the data on the server against manipulation. Additional security is provided by the intrusion detection and the lockable drive cover on the floorstand model and/or the lockable rack door.

The rack model occupies 4 height units (HU) in the rack.

1.1 Overview of the Documentation

PRIMERGY manuals are available in PDF format on the *ServerBooks* CD. The ServerBooks CD is part of the *ServerView Suite* delivered with each server system.

The PDF files for the manuals can also be downloaded free of charge from the Internet. The overview page showing the online documentation available in the Internet can be found via the URL: *http://manuals.fujitsu-siemens.com* (click *industry standard servers*).

Concept and Target Group of this Manual

This operating manual describes how to install, how to operate and how to expand your server.

This operating manual is intended for those responsible for installing the hardware and operating the system. The manual contains all the information required for mounting and operating your PRIMERGY TX200 S2.

Knowledge of hardware and data transmission is required, as well as basic knowledge of the operating system used.

Additional server documentation

To the PRIMERGY TX200 S2 documentation set belong the following additional manuals:

– "Safety" manual (print version delivered together with the system, PDF file available on the *ServerBooks* CD)

– "Warranty" manual (print version delivered together with the system, PDF file available on the *ServerBooks* CD)

– Technical Manual for the system board D1919 (PDF file available on the *ServerBooks* CD)

– BIOS Setup manual (PDF file available on the *ServerBooks* CD)

– "PRIMERGY ServerView Suite - ServerStart" (PDF file available on the *ServerBooks* CD)

– "PRIMERGY TX200 S2 Options Guide" (PDF file available on the *ServerBooks* CD))

– "Global Array Manager Client Software User's Guide" (PDF file available on the *ServerBooks* CD)

– "Integrated Mirroring User's Guide" (PDF file available on the *ServerBooks* CD)

If you need a backup of the *ServerBooks*-CD send the details of your server via email address: *Reklamat-PC-LOG@fujitsu-siemens.com*.

Further sources of information

– technical manual for the rack
– manual for the monitor
– server management manual *ServerView*
– manual for the Remote Test and Diagnostic System *RemoteView*
– in the documentation for the boards and drives
– operating system documentation
– information files of your operating system

(see also “Related Publications” on page 103).

1.2 Features

System board

The features of the system board (D1919) are described in the technical manual for the system board in relation to the hardware and in the BIOS setup manual for the firmware (see “Related Publications” on page 103).

Hard disk drives

The server has a drive cage that can accommodate up to six SCSI hard disk drive modules. Each hard disk drive module (HDD module) can accommodate a SCSI hard disk drive with an SCA (Single Connector Attachment) interface and a maximum height of 1 inch. The module is connected to the SCSI backplane without cables via the SCA interface. This allows hard disk drive modules to be simply plugged in or pulled out (for further details see section “Hot-plug Hard Disk Drives” on page 83).

The hard disk drives can be controlled by the onboard controller or by a RAID controller. If the server has a RAID controller and a corresponding RAID configuration, defective HDD modules can also be exchanged online (hot-swap).

A HDD extension box can be installed optionally (with a maximum of three HDD modules). The hard disk drives in the extension box can likewise be controlled by the onboard controller or by a RAID controller.

An external SCSI interface is also offered optionally to allow external storage subsystems to be connected. You find further information in the configurator (see “Related Publications” on page 103).

Onboard SCSI controller with Integrated Mirroring Enhanced functionality

For operating internal hard disk drives the 2-channel Ultra320 SCSI controller with Integrated Mirroring Enhanced functionality is available. Integrated Mirroring Enhanced offers additional RAID functionality for the internal disk configuration (RAID: level 1, 1E).

To configure Integrated Mirroring Enhanced the controller has its own RAID-Select Utility. For further information see “Integrated Mirroring User’s Guide“ on the *ServerBooks* CD (choose *Controllers* from the menu).

Zero Channel RAID (ZCR) controller (option)

Optionally a ZCR controller (PCI card) can be installed. In addition to RAID levels 1 and 1E ZCR controller offers the possibility to configure also RAID-5 or RAID-50. ZCR controller utilizes both channels of the onboard Ultra320 SCSI controller using a special integrated logic.

Accessible drives

Various mounting locations are available:

– Two 5.25 inch half-height (1.6 inch) locations for accessible drives (CD burner or magnetic tape drive). Alternatively, two of these locations can be used to install a 3.2 inch high accessible drive (magnetic tape drive) or HDD extension box.

– One 5.25 inch half-height (1.6 inch) location with a 3.5 inch floppy disk drive (1.44 MB). An additional slimline DVD-ROM drive can be installed optionally. You find further information in the Option Guide (see “Related Publications” on page 103).

The accessible drives cannot be replaced online.

A hot-plug tape drive can be installed optionally in the drive cage or in the HDD extension box (see also the configurator under “Related Publications” on page 103). Two mounting locations are occupied as a result in the drive cage or in the HDD extension box, which are then no longer available for HDD modules. This magnetic tape drive can be replaced online.

Power supply

In its basic configuration, the server has a fixed power supply unit or optionally a hot-plug wide range power supply unit that adjusts automatically to any power voltage in the range from 100 V to 240 V. An additional hot-plug power supply

unit can be installed optionally in order to ensure redundancy of the power supply. If one power supply unit fails, the second power supply unit in the redundant configuration ensures operation can continue uninterrupted. The defective power supply unit can be replaced online (for further details see section “Hot-plug Power Supply Units” on page 81).

Ventilation

Every CPU has a heatpipe and a CPU fan.

The server is cooled by means two or four system fans (optional redundant configuration).

The power supply unit fans are installed into the respective power supply unit.

Two system fans supported from the system board are integrated in the standard system fan configuration. If four system fans are required an additional board must be installed. If four system fans are installed, two system fans form a redundant pair.
If **one** fan in **one** redundant pair fails, the other fan ensures operation can continue uninterrupted. A defective system fan can be replaced online (for further details see section “Replacing a Hot-plug CPU/System Fan” on page 92).

High level of availability and reliability

When memory data is accessed, 1-bit errors in the main memory are recognized and automatically corrected with the ECC (Error Correcting Code) method. The patented memory scrubbing function regularly starts up the EDC mechanism and thus ensures continuous data integrity.

The memory modules used support SDDC technology (Chipkill™), which in addition increases the effectiveness of the monitoring and correction of memory errors.

Support is likewise provided for hot-spare memory technology, in which a memory bank is used like a replacement bank. If a memory module fails, the bank with the defective memory is automatically deactivated and the replacement bank is activated in its place (assuming it has been configured appropriately in the BIOS). The deactivated memory bank is no longer used and the faulty memory module can be replaced at the next opportunity. In order to be able to use the hot-spare memory function, all occupied memory banks must have an identical memory configuration.

ASR&R (Automatic Server Reconfiguration and Restart) restarts the system in the case of an error and automatically „hides“ the defective system components.

The PDA (Prefailure Detection and Analyzing) technology from Fujitsu Siemens Computers analyzes and monitors all components important for system reliability.

Optional RAID controllers support RAID Levels 0, 1 and 5 and increase system availability.

The hot-plug HDD modules provide additional availability.

Server management

Server management is implemented with the aid of the supplied *ServerView* software and PDA (Prefailure Detection and Analyzing) technology from Fujitsu Siemens Computers. PDA reports the threat of a system error or overloading early on so that preventative measures can be taken.

ServerView enables the management of all PRIMERGY servers in the network via a central console. The following key features are supported among others by *ServerView* in this context.

- Remote power-on (Wake On LAN)
- Intrusion detection in the floorstand model
- Temperature monitoring of the CPU and the surrounding area
- Monitoring of the utilization of the PCI buses
- Detailed status and error reports for bus systems, processors and main memory
- Watchdog timer for Automatic Server Reconfiguration and Restart (ASR&R) in the event of failure of memory modules or processors
- Power monitoring
- Early detection of a defective fan
- Watchdog timer for operating system monitoring and application monitoring with ASR&R

Further information on *ServerView* server management is provided in the associated documentation (see “Related Publications” on page 103).

ServerStart

You can configure the PRIMERGY server quickly and purposefully with the *ServerStart* software provided. User-guided menus are available for installing the server operating system (for further details see section “Configuring the Server” on page 70).

Service and Support

PRIMERGY servers are service-friendly and modular, thus enabling quick and simple maintenance.

The handles and locks (touch points) of the different hot-plug components are colored green to ensure simple and immediate recognition.

In order to avoid damage to components by incorrect handling when they are being installed and removed, green highlighting also identifies the component areas that can be touched without causing damage to the respective component.

The flash EPROM program supplied with the Fujitsu Siemens Computers utilities supports a fast BIOS update. The *RemoteView* remote test and diagnostics system allows the PRIMERGY TX200 S2 server to be maintained from remote locations. Remote diagnosis can be performed as a result for system analysis, remote configuration and remote restart should the operating system or hardware fail.

RemoteView

RemoteView is the remote management solution from Fujitsu Siemens Computers for Intel-based PRIMERGY systems. *RemoteView* 3.0 and the relevant hardware components integrated on the system board allow remote monitoring and maintenance as well as fast restoration of operability in the event of errors.

Remote monitoring and maintenance avoids time-consuming and costly on-site repairs and reduces service costs. This leads to a reduction in the total cost of ownership and an excellent return on investment for the remote management solution.

RemoteView helps

- switch ON/OFF the system remotely
- monitor systems and analyze the cause of faults
- prepare error resolution or to have this process initiated independently if possible
- identify potential sources of error
- configure the system
- adjust system settings and initiate system restarts from a remote location.

1.3 Notational Conventions

The following notational conventions are used in this manual:

text in italics	indicate commands, menu items or software programs.
„Quotation marks“	indicate names of chapters and terms that are being emphasized.
►	describes activities that must be performed in the order shown
CAUTION!	pay particular attention to texts marked with this symbol. Failure to observe this warning may endanger your life, destroy the system or lead to the loss of data.
	indicates additional information, notes and tips

Table 1: Notational conventions

1.4 Technical Data

Electrical data

	standard	hot-plug
Power supply unit	Wide range	
Rated voltage range	100 V - 240 V	
Frequency	50 Hz - 60 Hz	
Rated current in basic configuration:	100 V - 240 V / 4.4 A - 1.5 A	
AC outlet [1]	100 V - 240 V / 2,0 A	n. a.
Max. rated current:	100 V - 240 V / 9.0 A - 5.0 A	
Effective power	638 W	798 W
Apparent power	650 VA	809 VA
Heat dissipation	2297 kJ/h	2873 kJ/h (2723 btu/h)
Main power fuse	16 A	
Protection class	I	

[1] if available on the power supply unit

National and international standards

Product safety and ergonomics	IEC 60950-1 / EN 60950-1 / UL 60950 3rd. Ed., CAN/CSA-C22.2 No. 60950 3rd. Ed.
Electromagnetic compatibility	FCC class A CNS 13438 class A; VCCI class A AS / NZS 3548 class A
Interference emission	EN 55022 class A
Harmonic current	EN 61000-3-2
Flicker	EN 61000-3-3
Interference immunity	EN 55024
CE label according to EU directives	Low-Voltage Directive 73/23/EEC (Product safety) Electromagnetic Compatibility 89/336/EEC

Mechanical values

	Floorstand Model	**Rack Model**
Width	286 mm (with feet)	483 mm
Total depth	775 mm (with hot-plug PSU)	770 mm (with handles and hot-plug PSU)
Installation depth	----	735 mm
Height	473 mm (with feet)	177 mm or 4 HU

Weight

Approx. 25 - 40 kg (depending on the configuration)

Ventilation clearance

At least 200 mm on the front and on the rear side

Maintenance area for the floorstand model

1.2 m^2 on the left side of the server. The maintenance area can be occupied but must be freely accessible.

Environmental conditions

Environment class 3K2 Environment class 2K2	EN 60721 / IEC 721 section 3-3 EN 60721 / IEC 721 section 3-2
Temperature: Operation (3K2) Transport (2K2)	 10 °C .... 35 °C -25 °C ..... 60 °C
Humidity	10% ... 85%
Dust class 3S2	EN 60721

Condensation during operation must be avoided!

Noise level

Sound power level L_{WAd} (ISO 9296)	≤ 6.2 B (standby) ≤ 6.5 B (operating)
Sound pressure level at bystander position L_{pAm} (ISO 9296)	≤ 50 dB(A) (standby) ≤ 52 dB(A) (operating)

2 Installation Steps: Overview

In this chapter you will find an overview of the steps necessary to install your server system. Links guide you to sections where you can find more detailed information on the individual steps:

- At first, please take notice of chapter “Important Notes” on page 19 and the following, especially of „Safety“.
- Unpack the system, check the contents of the package for visible transport damage and check whether the delivery agrees with the details in the delivery note (see section “Unpacking the Server” on page 32).
- Transport the server to the place where you want to set it up.
- Make sure all necessary manuals (see section “Overview of the Documentation” on page 7) are available; possibly print of the PDF files.
- There can be additional ordered bulk components delivered with the server. For mounting refer to the original component documentation.
- Set up the floorstand model (see section “Setting Up the Floorstand Model” on page 32) or mount the rack model into the rack (see section “Installing/Removing the Rack Model into the Rack” on page 35).
- Cable the server. Please also refer to the section “Connecting Devices to Server” on page 51 and section “Instructions on Connecting and Disconnecting Cables” on page 55.
- Connect the system to the line voltage (see section “Connecting the Server to the Line Voltage” on page 53).
- Make yourself familiar with the operating and indicator elements on the front and on the rear side of the server (see section “Operating and Indicator Elements” on page 59).
- Configure and install the desired operating system and applications. To do so, you have the following possibilities:
  - Remote configuration and installation with *ServerStart*:

    With the *ServerStart*-CD provided, you can configure the server and install the operating system in a convenient manner.

    To find out how to operate *ServerStart* and for further information, refer to the corresponding booklet „PRIMERGY ServerView Suite - ServerStart“.

You find additional information for configuration section “Configuration with ServerStart” on page 70).

– Local configuration and installation with or without *ServerStart* (see section “Configuration with ServerStart” on page 70 and/or section “Configuration without ServerStart” on page 71).

For further information on remote or local installation of the server please refer to the ServerStart manual. The manual contains a “Quick Step Guide“. A PDF version of the manual is contained on the PRIMERGY ServerBooks CD.

3 Important Notes

In this chapter you will find essential information regarding safety when working with your server.

3.1 Safety

The following safety notes are also provided in the “Safety” manual.

This device complies with the relevant safety regulations for data processing equipment.

If you have any questions about where you can set up the device, contact your sales outlet or our customer service team.

CAUTION!

The actions described in these instructions should only be performed by technical specialists. Equipment repairs should only be performed by authorized, qualified staff. Any unauthorized openings and improper repairs could expose the user to risks (electric shock, energy hazards, fire hazards) and could also damage the equipment. Please note that any unauthorized openings of the device will result in the invalidation of the warranty and exclusion from all liability.

Before operating the device

CAUTION!

- During installation and before operating the device, observe the instructions on environmental conditions for your device (see section “Technical Data” on page 15).
- If the device is brought in from a cold environment, condensation may form both inside and on the outside of the machine.

  Wait until the device has acclimatized to room temperature and is absolutely dry before starting it up. Material damage may be caused to the device if this requirement is not observed.
- Transport the device only in the original packaging or in packaging that protects it from knocks and jolts.

Installation and operation

CAUTION!

- If the rack model is integrated in an installation that receives power from an industrial (public) power supply network with the IEC309 connector, the (public) power supply protection must comply with the requirements for the non-industrial (public) power supply networks for the type A connector.
- The server automatically sets itself to a voltage in the range of 100 V to 240 V. Make sure that your local voltage is within this range.
- This device has a specially approved power cable and must only be connected to a grounded insulated socket.
- Ensure that the power socket on the device or the grounded wall outlet is freely accessible.
- The ON/OFF button does not disconnect the device from the mains voltage. To disconnect from the mains completely, switch OFF the mains power switch (if available on the standard PSU) and remove the power plug(s) from the grounded insulated socket(s).

CAUTION!

- Always connect the device and the attached peripherals to the same power circuit. Otherwise you run the risk of losing data if, for example, the central processing unit is still running but the peripheral device (e.g. storage subsystem) has failed during a power outage.
- Data cables to peripheral devices must be adequately shielded.
- To the LAN wiring the requirements apply in accordance with the standards EN 50173 and EN 50174-1/2. As minimum requirement the use of a protected LAN line of category 5 for 10/100 MBps Ethernet, and/or of category 5e for Gigabit Ethernet is considered. The requirements of the specification ISO/IEC 11801 are to be considered.
- Route the cables in such a way that they do not form a potential hazard (make sure no-one can trip over them) and that they cannot be damaged. When connecting up a device, refer to the relevant notes in this manual.
- Never connect or disconnect data transmission lines during a storm (lightning hazard).
- Make sure that no objects (such as bracelets or paper clips) fall into or liquids spill into the device (risk of electric shock or short circuit).
- In emergencies (e.g. damaged casing, controls or cables, penetration of liquids or foreign matter), switch off the device immediately, remove the power plug and contact your sales outlet or customer service team.
- Proper operation of the device (in accordance with IEC 60950/ EN 60950) is only ensured if the casing is completely assembled and the rear covers for the installation openings have been put in place (electric shock, cooling, fire protection, interference suppression).
- Only install system expansions that satisfy the requirements and rules governing safety and electromagnetic compatibility and relating to telecommunications terminal equipment. If you install other expansions, you may damage the system or violate the safety regulations and regulations governing RFI suppression. Information on which system expansions are suitable can be obtained from the customer service centre or your sales outlet.

CAUTION!

- The components marked with a warning label (e.g. lightning symbol) may only be opened, removed or exchanged by authorized, qualified personnel. The hot-plug power supply units are exceptions to this rule.
- The warranty expires if the device is damaged during the installation or replacement of system expansions.
- You may only set those resolutions and refresh rates specified in the „Technical data“ section of the monitor description. Otherwise, you may damage your monitor. If you are in any doubt, contact your sales outlet or customer service centre.

Batteries

CAUTION!

- Incorrect replacement of batteries may lead to a risk of explosion. The batteries may only be replaced with identical batteries or with a type recommended by the manufacturer (see the technical manual for the system board under “Related Publications” on page 103).
- Do not throw batteries into the trash can. They must be disposed of in accordance with local regulations concerning special waste.
- The battery must be disposed of in accordance with local regulations concerning special waste.
- Replace the lithium battery on the system board in accordance with the instructions in the technical manual for the system board (see “Related Publications” on page 103).
- All batteries containing pollutants are marked with a symbol (a crossed-out garbage can). In addition, the marking is provided with the chemical symbol of the heavy metal decisive for the classification as a pollutant:

  Cd Cadmium
  Hg Mercury
  Pb Lead

Notes on handling CDs and CD-/DVD-ROM drives

CAUTION!

- Use only CDs in proper condition in the CD-/DVD-ROM drive of your server to prevent data loss, damage to the device and injuries.
- Therefore, check each CD for damage, cracks, breakage etc. before inserting it in the drive.

  Please note that any additional labels applied may change the mechanical properties of a CD and cause imbalance.

  Damaged and imbalanced CDs can break at high drive speeds (data loss).

  Under certain conditions sharp-edged pieces of broken CDs can penetrate the cover of the drive (damage to the device) and be thrown out of the device (danger of injury, particularly on uncovered body parts such as the face or neck).

You protect the CD-/DVD-ROM drive and prevent mechanical damage, as well as premature wearing of the CDs, by observing the following suggestions:

- Only insert the CDs in the drive when needed and remove them after use.
- Store the CDs in suitable sleeves.
- Protect the CDs from exposure to heat and direct sunlight.

Note about the laser

The CD-/DVD-ROM drive is classified for laser class 1according to IEC 60825-1.

CAUTION!

The CD-/DVD-ROM drive contains a laser diode (LED). Sometimes the LED produces a stronger laser beam than laser class 1. Direct view into this laser beam is dangerous.

Never remove parts of the CD-/DVD-ROM drive assembly!

Modules with electrostatic-sensitive components

Systems and components that might be damaged by electrostatic discharge (ESD) are marked with the following label:

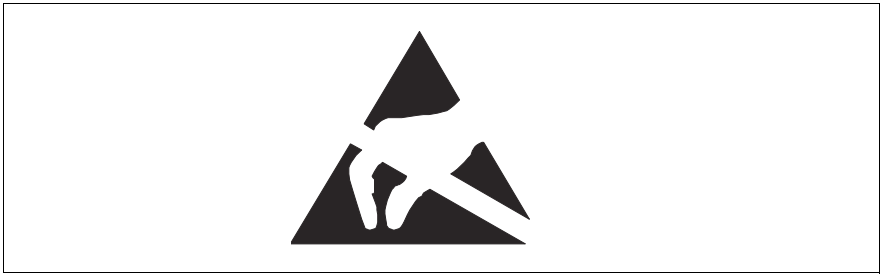

Figure 1: ESD label

When you handle components fitted with ESDs, you must observe the following points under all circumstances:

- Remove the power plug from the power socket before inserting or removing components containing ESDs.
- You must always discharge yourself of static charges (e.g. by touching a grounded object) before working.
- The equipment and tools you use must be free of static charges.
- Only touch the components at the positions highlighted in green (touch points).
- Do not touch any exposed pins or conductors on a component.
- Use a grounding cable designed for this purpose to connect yourself to the system unit as you install components.
- Place all components on a static-safe base.

You will find a detailed description for handling ESD components in the relevant European or international standards (EN 61340-5-1, ANSI/ESD S20.20).

Other important points:

- When cleaning the device, please observe the relevant notes in section “Cleaning the Server” on page 72.
- Keep this operating manual and all additional documentation (such as the technical manual, CD) together with the device. All documentation should be included if the device is passed on to a third party.

3.2 CE Certificate

CE The shipped version of this device complies with the requirements of the EEC directives 89/336/EEC „Electromagnetic compatibility“ and 73/23/EEC „Low voltage directive“. The device therefore qualifies for the CE certificate (CE=Communauté Européenne).

3.3 FCC Class A Compliance Statement

If there is an FCC statement on the device, then:

The following statement applies to the products covered in this manual, unless otherwise specified herein. The statement for other products will appear in the accompanying documentation.

NOTE:

This equipment has been tested and found to comply with the limits for a „Class A“ digital device, pursuant to Part 15 of the FCC rules and meets all requirements of the Canadian Interference-Causing Equipment Standard ICES-003 for digital apparatus. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in strict accordance with the instructions, may cause harmful interference to radio communications. However, there is no warranty that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/T.V. technician for help.

Fujitsu Siemens Computers is not responsible for any radio or television interference caused by unauthorized modifications of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by Fujitsu Siemens Computers. The correction of interferences caused by such unauthorized modification, substitution or attachment will be the responsibility of the user.

The use of shielded I/O cables is required when connecting this equipment to any and all optional peripheral or host devices. Failure to do so may violate FCC and ICES rules.

3.4 Transporting the Server

CAUTION!

Only transport the server to the new site in its original packaging or in packaging that protects it from knocks and jolts. Do not unpack the server until it is at its installation location.

If you need to lift or transport the server, ask other people to help you.

Never lift or transport the server using the handles on the front panel.

3.5 Notes on Installing into the Rack

CAUTION!

- **For safety reasons, at least two people are required to install the system in the rack because of its weight and size.**
- When connecting and disconnecting cables, observe the relevant notes in the chapter „Important notes“ in the technical manual for the corresponding rack. The technical manual is supplied with the corresponding rack.
- Make sure when installing the rack that the anti-tilt mechanism is properly mounted.
- For safety reasons, no more than one unit may be removed from the rack at any one time during installation and maintenance work.

  If several units are removed from the rack at the same time, there is a risk that the rack will tilt forward.
- The rack must be connected to the power supply by an authorized specialist (electrician).
- If the rack model is integrated in an installation that receives power from an industrial (public) power supply network with the IEC309 connector, the (public) power supply protection must comply with the requirements for non-industrial (public) power supply networks for the type A connector.

3.6 Environment Protection

Environmentally-friendly product design and development

This product has been designed in accordance with the Fujitsu Siemens Computers standard for “environmentally friendly product design and development”. This means that key factors such as durability, selection and labeling of materials, emissions, packaging, ease of disassembly and recycling have been taken into account.

This saves resources and thus reduces the harm done to the environment.

Notes on saving energy

Devices that do not have to be switched on permanently should be switched off until they are needed as well as during long breaks and after completion of work.

Notes on packaging

Please do not throw away the packaging. You may need it later for transporting your system unit. If possible, the device should only be transported in its original packaging.

Notes on dealing with consumables

Please dispose of printer consumables and batteries in accordance with local government regulations.

Do not throw batteries or rechargeable batteries into the trash can. They must be disposed of in accordance with local regulations concerning special waste.

Note on labeling plastic parts

Please avoid sticking your own labels on plastic parts wherever possible, since this makes it difficult to recycle them.

Returning, recycling and disposal

For details on take-back and reuse of devices and consumables within Europe, contact your Fujitsu Siemens Computers branch office/subsidiary or our recycling center in Paderborn:

Fujitsu Siemens Computers
Recycling Center
D-33106 Paderborn

Tel. +49 5251 8180-10

Fax +49 5251 8180-15

4 Hardware Installation

CAUTION!

Please note the safety instructions in chapter “Important Notes” on page 19.

Do not expose the server to extreme environmental conditions (see section “Technical Data” on page 15). Protect it from dust, humidity, and heat.

Never expose a HDD module to a temperature shock (see section “Handling Hard Disk Drives/HDD Modules” on page 83).

Avoid the formation of condensation inside and on the outside of the hard disk drives before setting up the server must be acclimatized in its operating environment for an acclimatization time (table 2).

Temperature difference (°C)	Minimum acclimatization time (hours)
5	3
10	5
15	7
20	8
25	9
30	10

Table 2: Acclimatization time

The temperature difference in table 2 represents the difference between the operating temperature and the external, transport or storage temperature.

4.1 Unpacking the Server

CAUTION!

Please note the safety instructions in chapter “Important Notes” on page 19.

If you need to lift or transport the server, ask other people to help you.

Do not unpack the server until it is at its installation location.

It is recommended not to throw away the original packaging material as it may be required for transportation at a later date.

- ► Unpack all individual parts.
- ► Check the delivery for any damage during transport.
- ► Check whether the delivery agrees with the details on the delivery receipt.

The identification rating plate is located on the rear area on the server.

Notify your supplier immediately should you discover that the delivery does not correspond to the delivery receipt.

4.2 Setting Up the Floorstand Model

If no floorstand model is to be installed continue with section “Installing/Removing the Rack Model into the Rack” on page 35:

CAUTION!

Please note the safety instructions in chapter “Important Notes” on page 19.

- ► Transport the server to the place where you want to set it up.
- ► Unpack the server (see section “Unpacking the Server”).

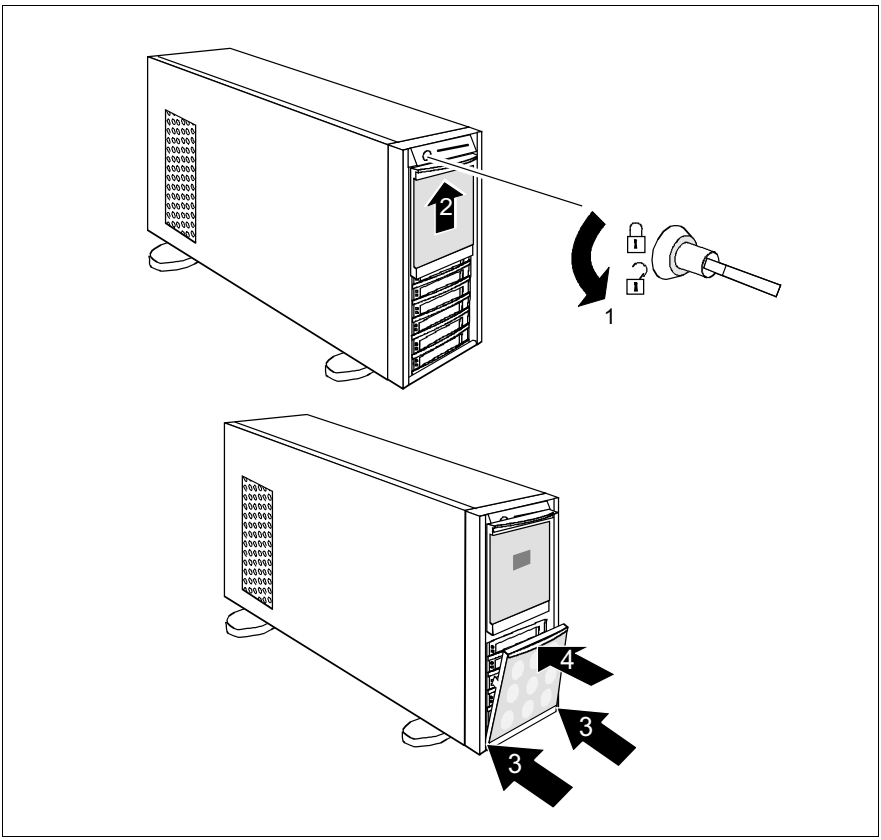

Figure 2: Mounting HDD cover

- ► Unlock the server (1) and remove the key (figure 2 on page 33).
- ► Slide up the drive cover (2) as far as possible (2) until it engages (approx. 0.5 cm above the closed position).
- ► Hook the tabs of the hard disk drive cover of into the recesses (3).
- ► Push the top end of the cover (4) in direction of the arrow until it engages.

► Set up the server.

CAUTION!

– The device must be protected against direct sunlight.
– The required minimum distances for operation and maintenance areas (see “Maintenance area for the floorstand model” on page 16) must be adhered to.
– In order to connect other devices (e. g.: storage subsystem) the rear of the server must be accessible.
– The mains plug must be accessible easily and safely.
– There must be a clearance of at least 200 mm in front of and behind the server to ensure adequate ventilation.

► Cabling the server. Please also refer to the section “Connecting Devices to Server” on page 51 and section “Instructions on Connecting and Disconnecting Cables” on page 55.

► Connect the server to the power supply (see section “Connecting the Server to the Line Voltage” on page 53).

4.3 Installing/Removing the Rack Model into the Rack

CAUTION!

- Please observe the safety notes and notes on mounting into the rack in chapter “Important Notes” on page 19.
- At least two people are needed to position the server into/out of the rack.
- The rack can tip over when more than one unit is pulled out.
- The server may not occupy the top height unit of the rack (42 HU Classic Rack, 38 HU/42 HU PRIMECENTER Rack and/or DataCenter Rack), as otherwise no board and/or system fan can be replaced even with the unit pulled out completely.

Requirements of the rack

The rack systems of the Fujitsu Siemens Computers GmbH (PRIMECENTER Rack; DataCenter Rack and 19-Inch (Classic) Rack) support fully the installation of the PRIMERGY server systems. The installation into the at present usual rack systems of different foreign manufacturers (3rd-Party Rack) is supported to large part.

To accommodate the ventilation concept and ensure proper ventilation of the components in the rack, any unused areas must be closed using dummy covers.

The power is supplied via the socket strips available in the rack.

The main features of the rack systems of the Fujitsu Siemens Computers are:

PRIMECENTER Rack

– Frontally bolted telescopic rails.

  The rails are provided with a linear alignment possibility to ensure also an adjustment to different rack depths.

– Extended cable management within the lateral rack area.

DataCenter Rack

– Frontally bolted telescopic rails (except within the rear left area where a support bracket is used).
– Extended cable management within the lateral rack area.

19-Inch (Classic) Rack

– Directly laterally bolted telescopic.
– Cable management by using an articulated cable carrier.

The mounting of the rails in the different racks is described in the next sections.

The mounting of the cable management is described in detail in the Technical Manual to the respective rack.

To rack systems of different foreign manufacturers the following applies:

3rd-Party Rack

Certain boundary conditions are to be fulfilled:

– Installation dimensions (see the dimensions shown in figure 3 on page 37).

1	rack front side
2	rack rear side
A	rack depth (comparison PRIMECENTER Rack 940/1000 mm)
B	rack width (comparison PRIMECENTER Rack 700 mm)
C	clearance of the 19-inch installation level
C1	front 19-inch installation level
C2	rear 19-inch installation level
D	area for cable routing (cable area depth) and ventilation
E	area for front panel and ventilation
F	right and left area for support systems
P	PRIMERGY installation depth
a1	front left support upright
a2	front right support upright
b1	rear left support upright
b2	rear right support upright

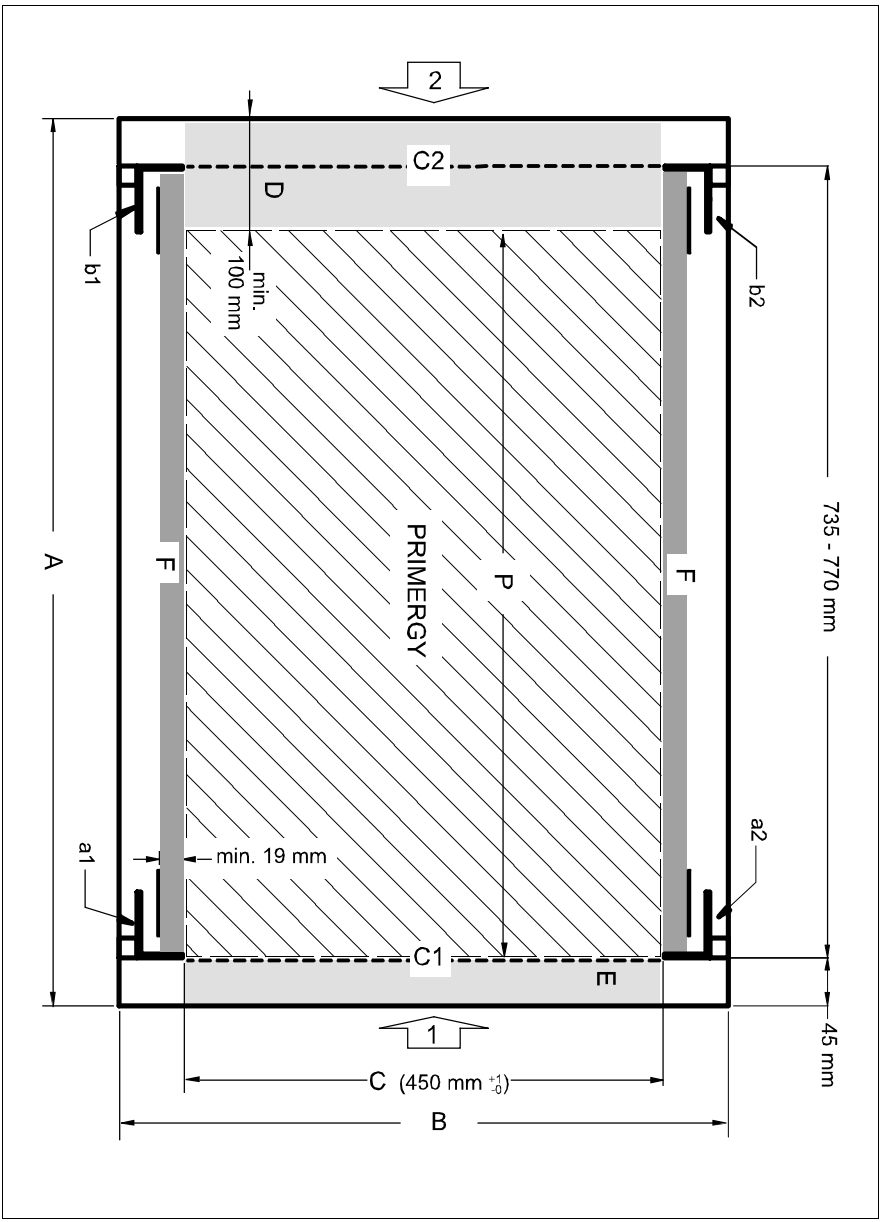

Figure 3: Mechanical conditions

– The operability of the safety mechanisms at the server e.g. stoppers or holding back systems must be guaranteed.

– The form of the rack support uprights must ensure the frontal screwing on of the rails.

– Frontally bolted telescopic rails.

  The rails are provided with a linear alignment possibility to ensure also an adjustment to different rack depths.

– No support of the cable management (delivered with the mounting kit).

– Climatic conditions.
  For the ventilation of the installed server a large extent unhindered air intake in the rack front and air discharge in the rear cover of the rack are necessary.

  In principle the ventilation concept plans that the necessary cooling is reached by the horizontal self-ventilation of the installed devices (air flow from the front to the rear).

– Power supply.
  For the installation in 3rd-Party Racks it is to be made certain that appropriate socket strips are present.

4.3.1 Mounting into PRIMECENTER/DataCenter Rack

For mounting the server into the PRIMECENTER Rack the following parts are necessary:

– support bracket
– two telescopic rails (assembled)
– eight plugwashers and screws

General information are provided in the Technical Manual for the corresponding rack (see also “Related Publications” on page 103).

For mounting the left telescopic rail in the corresponding Rack, the delivered support bracket must first be mounted on the rear left support upright. The bracket must be mounted level with the lower edge of the device.

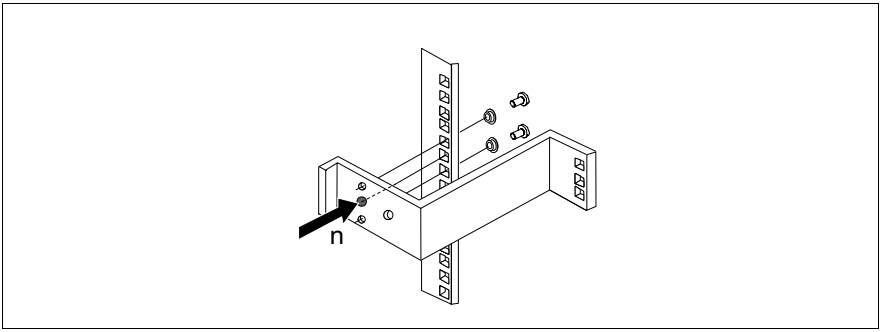

Figure 4: Mounting the support bracket

- Place the support bracket at the appropriate height on the left rear support upright (insert the positioning nub into the corresponding hole).
- Place the plugwashers in the holes of the support upright at the attachment points and secure the bracket as described in the Technical Manual of the corresponding Rack.

> **i** For better orientation the height units are marked on the support uprights (PRIMECENTER Rack only).

To fasten the telescopic rails, no flange nuts are necessary since the assembly brackets and/or the rails are equipped with threaded holes. For adjustment in each case two mounting springs or plugwashers must be pre-mounted at the support uprights and the support bracket (see figure 5 on page 40).

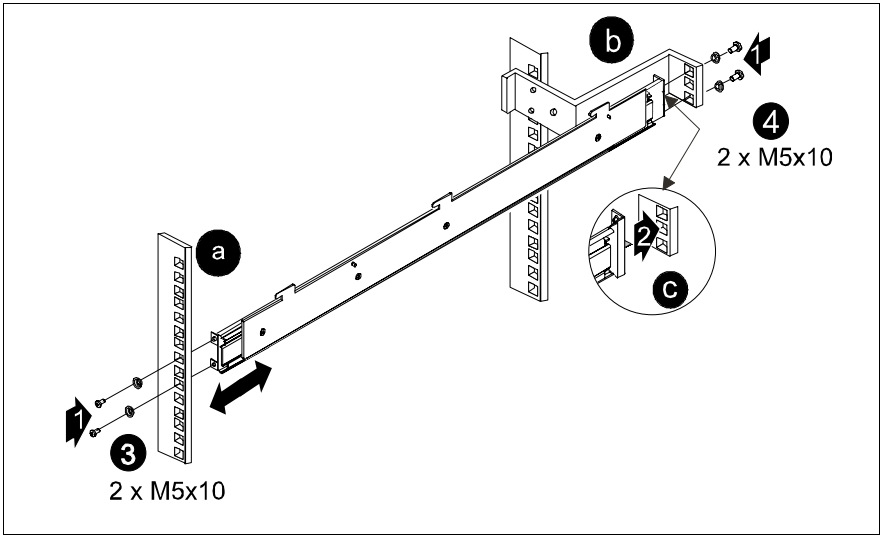

Figure 5: Mounting the telescopic rails in the PRIMECENTER/DataCenter Rack

- Place the plugwashers in the holes of the support uprights (a) and/or the support upright (b) at the marked attachment points (1).

  For better orientation the height units are marked on the support uprights (PRIMECENTER Rack only).

- There is a small horizontal lead (c) between the securing holes on the rear end of the left telescopic rail. Fit this lead in the corresponding hole of the support bracket (2) and secure the telescopic rail on the frontal left support upright with two screws M5x10 (3).
- Secure the telescopic rail with two screws M5x10 each (4) at the support bracket.

  If the rails are provided with a linear alignment possibility an automatically adjustment to different rack depths is ensured, in other case the adjustment must be performed manually.

- Repeat the steps with the right telescopic rail (to be mounted on the right support uprights).
- Mount the cable management as described in the Technical Manual of the corresponding Rack.
- Mount the server (see section “Installing the Server” on page 46).

4.3.2 Mounting into the Classic Rack

For mounting the server into the Classic Rack (19-inch) the following parts are necessary:

– two telescopic rails (assembled)
– protective hose for fibre channel optical waveguide cable

General information are provided in the Technical Manual for the Classic (19 inch) Rack (see also “Related Publications” on page 103).

► Mark the position of the attachment points for the telescopic rails and for the server (front panel) on the support uprights (four height units).

► Place the spring nuts to fasten the telescopic rails in the groove of the support uprights at the marked attachment points.

► Adjust the position of the nuts in the groove until they lock into the correct position.

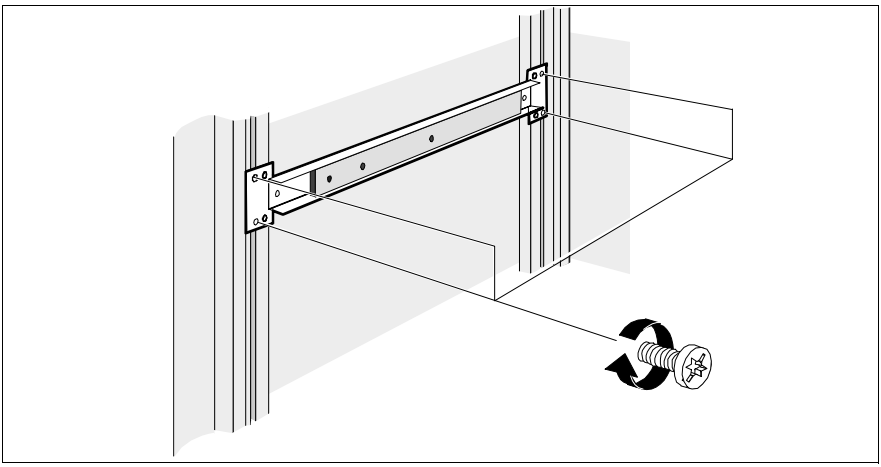

Figure 6: Mounting the telescopic rail into the Classic Rack

► Secure the two telescopic rails with two screws M5 each in the rack at the right and left support uprights.

Please note that the guide nubs of the telescopic rails next to the spring nuts must fit into the holes in the support uprights.

► Mount the server (see section “Installing the Server” on page 46).

Mounting the articulated cable carrier (cable management)

CAUTION!

In contrast to the instruction in the Technical Manual for the Classic (19-inch) Rack the articulated cable carrier is fastened only to the support upright - **not at the server**.

- To secure the articulated cable carrier place two spring nuts in the groove of the rear right support upright. The mounting height must agree with the height of the connecting cables at the server.

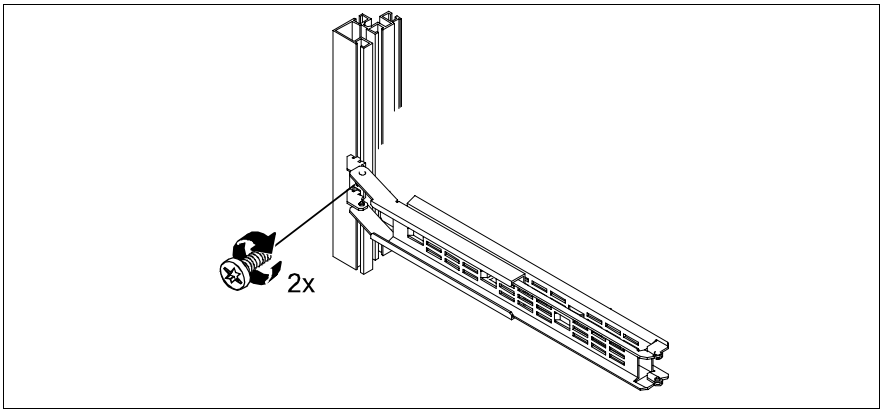

Figure 7: Mounting the articulated cable carrier

- Fix the articulated cable carrier with two mounting screws on the rear right support upright.

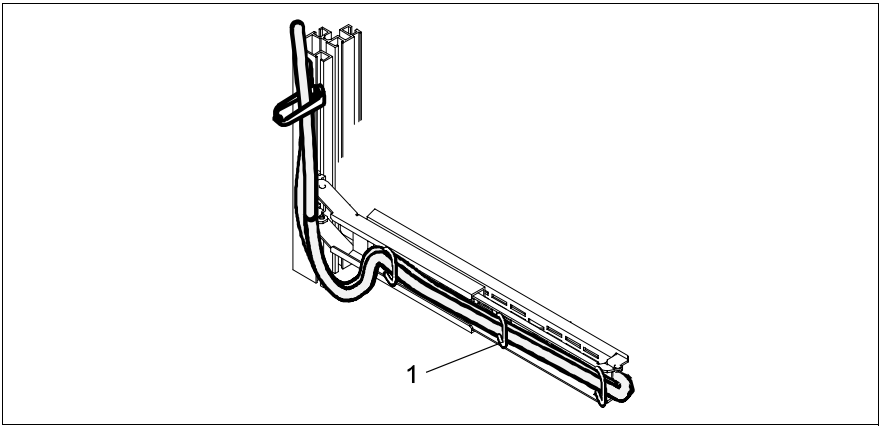

Figure 8: Routing the cables on the articulated cable carrier

- Route the cables as shown in the figure and secure them to the articulated cable carrier with cable ties (1).

CAUTION!

In order to avoid damages at fibre channel optical waveguide cables these must be encased with a protective hose (see Routing the fibre channel optical waveguide cable).

Securing the cables to the articulated cable carrier ensures that, if the server is pulled out the articulated cable carrier extends themselves.

The server can be pulled out so later without further preparations.

Routing the fibre channel optical waveguide cable

The protective hose (length approx. 1m) supplied with the mounting kit has a separable design.

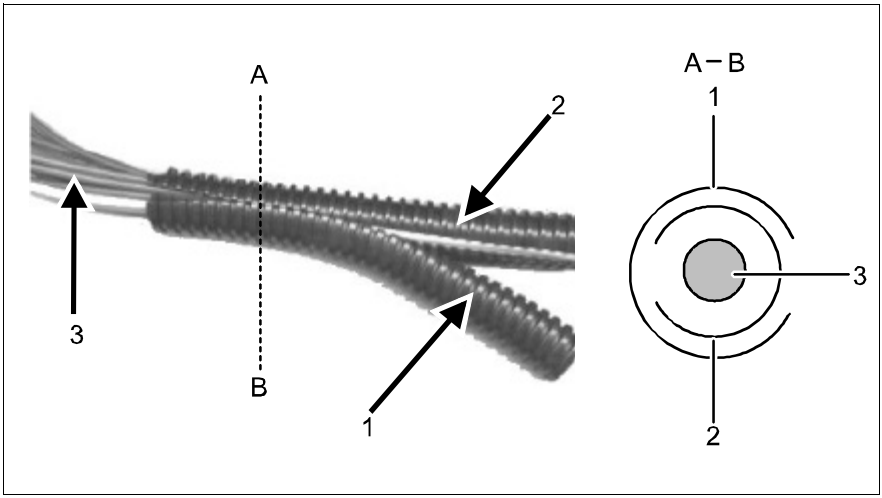

Figure 9: Mounting the protective hose

- ► Separate the outside protective sheath (1) from the inside sheath.
- ► Carefully laid the fibre channel optical waveguide cable (3) into the inside protective sheath (2).
- ► Push the outside protective sheath (1) over the inside protective sheath.

CAUTION!

The sheath openings must be arranged moving in opposite direction as shown in the sectional view A-B.

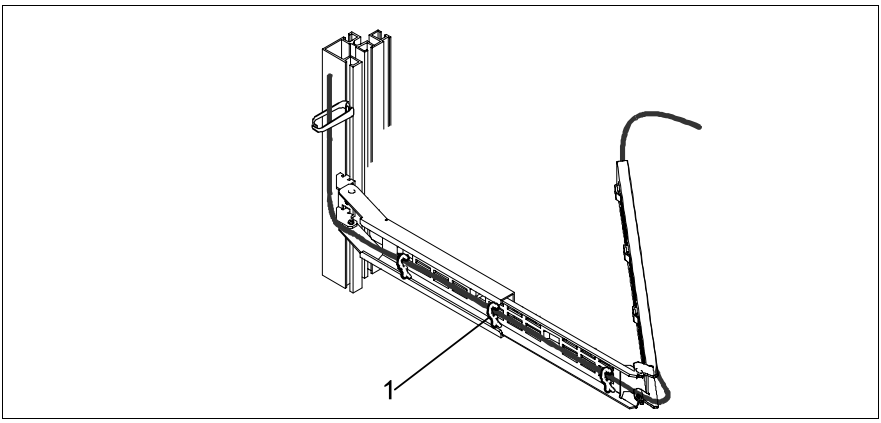

Figure 10: Routing the fibre channel optical waveguide cable with protective hose

► Route the fibre channel optical waveguide cable on the articulated cable carrier as shown in the figure and secure them with cable ties (1).

CAUTION!

Please make sure that the so protected fibre channel optical waveguide cable is routed in such a way on the articulated cable carrier that in the extended as well as in the folded condition of the carrier no damages can occur.

4.3.3 Mounting into 3rd-Party Racks

For mounting the server into the 3rd-Party Rack the following parts are necessary:

– two telescopic rails (assembled)
– possibly eight plugwashers
– possibly protective hose for fibre channel optical waveguide cable

► Take the manual of the rack manufacturer regarding the mechanical installation and/or the climatic conditions to assistance.

CAUTION!

With the installation in 3rd-Party Rack it is to be made certain that the air flow is ensured from the front to the rear in the rack.

► Mount the necessary manufacturer original parts (like support bracket or cable management).

Sometimes a number of parts of the delivered mounting kit cannot be used because original parts of the 3rd-Party Rack are to be used.

- ► Mount the telescopic rails in the 3rd-Party Rack as described in section “Mounting into PRIMECENTER/DataCenter Rack” on page 38.
- ► Mount the server (see section “Installing the Server” on page 46).
- ► Route the cables as described in the original manual of the Rack.

4.3.4 Installing the Server

CAUTION!

At least two people are needed to position the server in the rack.

PRIMECENTER/DataCenter Rack

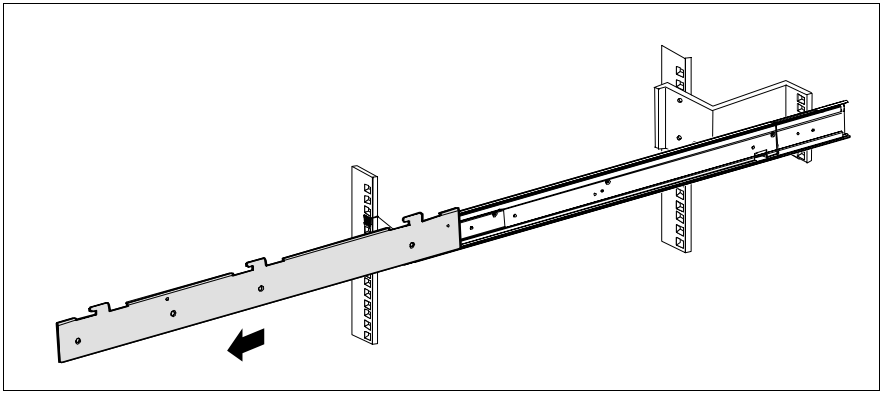

Figure 11: Pulling the telescopic rail out

- ► Pull the mounted telescopic rails completely out toward the front. They must click into place so that you can no longer push them back.

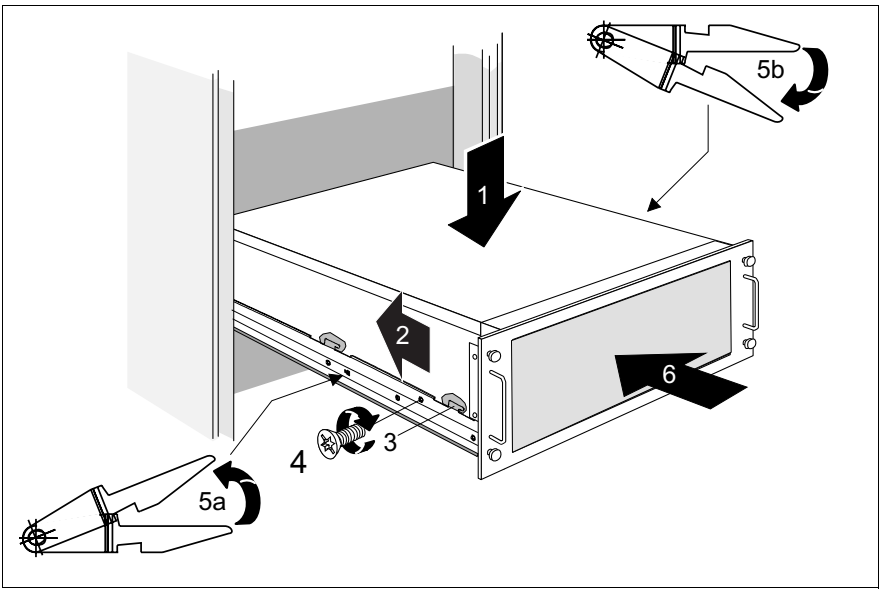

Figure 12: Installing the server

► Lift the server onto the two projecting telescopic rails (1).

CAUTION!

Never lift or transport the server using the handles on the front panel.

► Slide the server a little in the direction marked (2) until the noses (3) engage. When doing this, ensure that the telescopic rails are kept in a locked position.

► Secure the server to the telescopic rails using two M3x6 screws for each side one (4).

The following steps can then be carried out by one person only.

► Release the locking mechanism of both rails (5a + 5b) and insert the server completely into the rack (6).

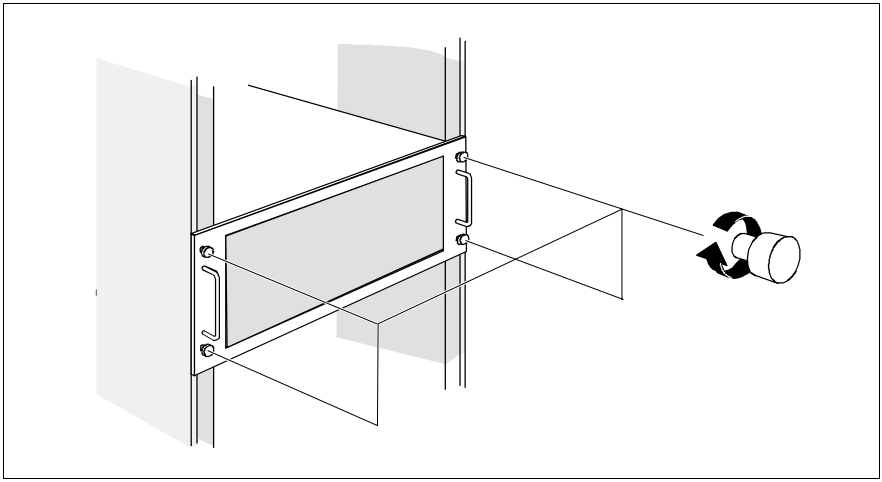

Figure 13: Fastening the server

- Place the cage nuts for fastening the front panel in the corresponding holes of the front support uprights and fasten the server using four knurled screws.
- Route the cables with the inserted server as described in the Technical Manual of the corresponding Rack.

To remove the server, follow the same procedure in the reverse order.

Classic (19 inch) Rack

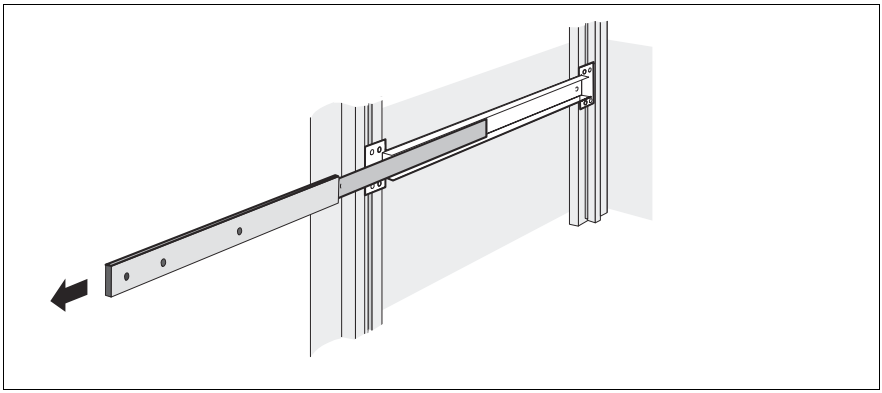

Figure 14: Pulling the telescopic rail out

► Pull the mounted telescopic rails completely out toward the front. They must click into place so that you can no longer push them back.

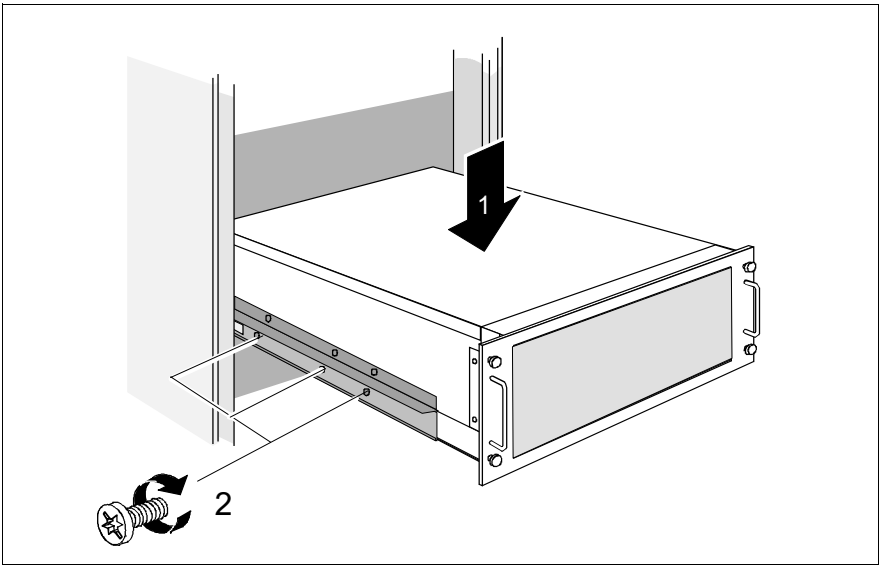

Figure 15: Installing the server (Classic Rack)

► Lift the server onto the two projecting telescopic rails (1).

CAUTION!

Never lift or transport the server using the handles on the front panel.

► Position the server so that the holes of the telescopic rails are in the line with those of the server. When doing this, ensure that the telescopic rails are kept in a locked position.

► Secure the server to the telescopic rails using three M3x6 screws for each side (2).

The following steps can then be carried out by one person only.

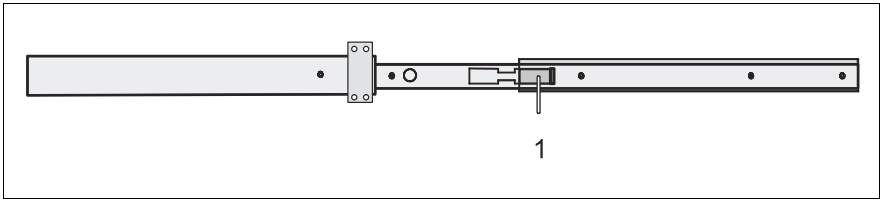

Figure 16: Telescope bar with safety spring

► Press in the safety springs (1) on both telescope bars.

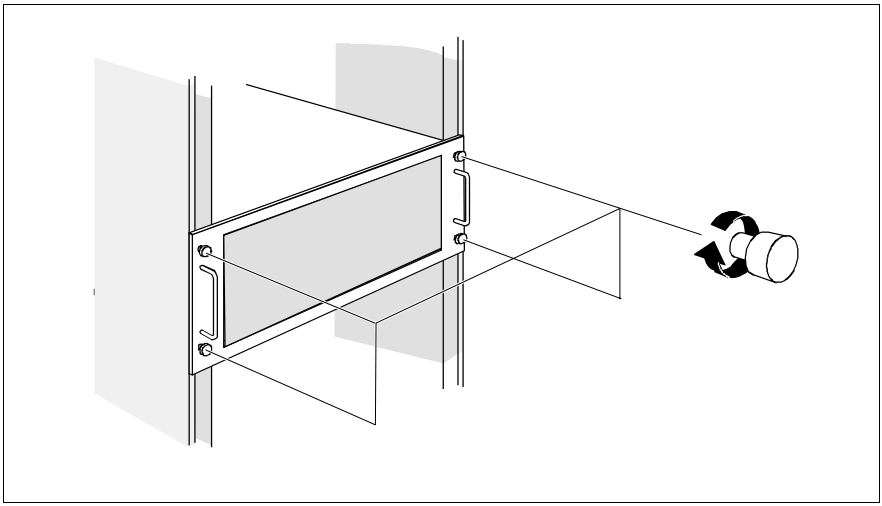

Figure 17: Fastening the server

► Slide the server into the rack.

► Place the cage nuts for fastening the front panel in the corresponding holes of the front support uprights and fasten the server using four knurled screws.

► Route the cables with the inserted server as described in the Technical Manual of the corresponding Rack.

To remove the server, follow the same procedure in the reverse order.

4.4 Connecting Devices to Server

The ports for external devices are on the rear of the server. Which additional ports are available on your server depends on the PCI boards installed.

The standard ports (figure 18) are marked with symbols, and some are color-coded.

1	Mouse port (PS/2) (green)	5	Monitor port (VGA) (blue)
2	Serial port COM2 (turquoise)	6	USB port 1 and 2 (black)
3	Optional parallel port (burgundy)	7	Serial port COM1 (turquoise) (alternatively BMC interface)
4	LAN port (with integrated indicators)	8	Keyboard port (PS/2) (purple)
		9	Global Error and ID indicators

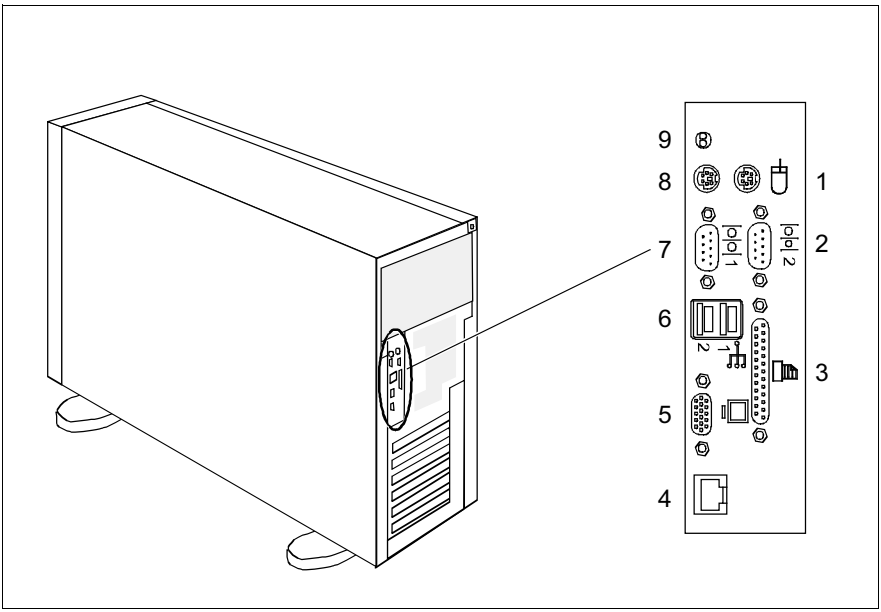

Figure 18: Floorstand model: ports

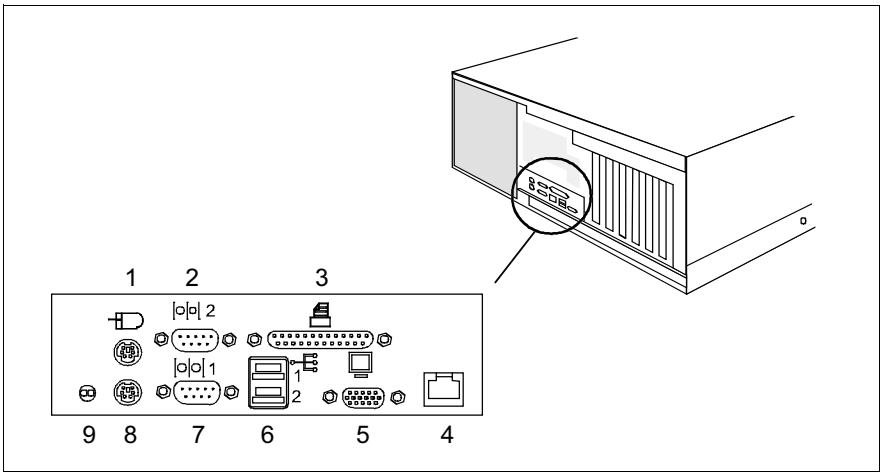

Figure 19: Rack model: ports

Some of the devices that can be connected may require special drivers (see the documentation for the connected device).

► Connect the data cables to the server and peripherals.

You can find an additional USB port on the front of the server (see figure 23 on page 59).

Connecting the keyboard, mouse and monitor

► Connect the monitor, the keyboard and mouse to the standard ports of the server (see figure 18 on page 51 and figure 19 on page 52).

If a separate graphics card is installed in a slot, the graphic controller on the system board is automatically deactivated. The corresponding monitor port can not be used. Plug the data cable of the monitor into the monitor port of the graphics card.

► Connect the power cable of the monitor to a grounded mains outlet of the in-house mains and/or into the mains socket strip of the rack.

CAUTION!

The rated current for the monitor can be found on the technical data label on the monitor or in the operating manual for the monitor.

4.5 Connecting the Server to the Line Voltage

In its basic configuration level the server has a fixed power supply unit.

This power supply unit can optionally be replaced with a hot-plug power supply unit. A second hot-plug power supply unit can be added to achieve redundant power supply. If a defect occurs in one power supply unit, the respective other power supply unit ensures unimpaired further operation.

CAUTION!

The server automatically sets itself to a voltage in the range of 100 V to 240 V. Make sure that your local voltage is within this range.

A phase redundancy in the power supply of the server can be set up if two hot-plug power supply units are installed.

In this case the two power supply units are directly connected either to two different phases or to two different power circuits of the in-house mains.

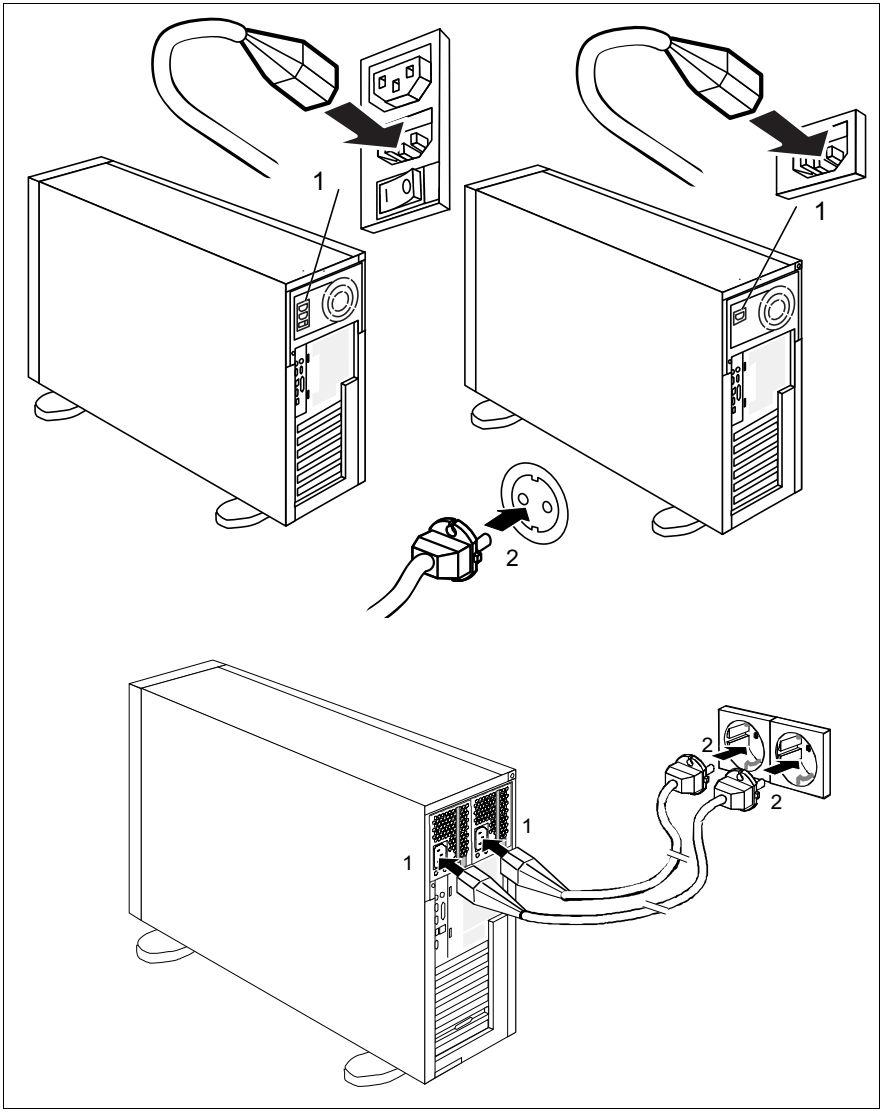

Figure 20: Connecting the server to the line voltage

- Connect the insulated connector of the power cable to the power supply unit of the server (1), and the power plug to a grounded mains outlet (2) of the in-house mains and/or into the mains socket strip of the rack (see Technical Manual of the rack).

4.6 Instructions on Connecting and Disconnecting Cables

CAUTION!

Be sure to read the documentation for the peripheral devices before connecting them.

Do not connect or disconnect data cables during a thunderstorm.

When removing a cable, always hold it by the plug. Never unplug a cable by pulling at the cable itself.

Connect and disconnect the cables in the order described below.

Connecting cables

- ► Turn off all power and equipment switches.
- ► Pull all power plugs out of the grounded power sockets.
- ► Plug all cables into the server and peripherals.
- ► Plug all data communication cables into the utility sockets.
- ► Plug all power cables into the grounded power sockets.

Disconnecting cables

- ► Turn off all power and equipment switches.
- ► Pull all power plugs out of the grounded power sockets.
- ► Unplug all data communication cables from the utility sockets.
- ► Disconnect the relevant cables from the server and all the peripherals.

5 Preparation for Use and Operation

CAUTION!

Please note the safety instructions in chapter “Important Notes” on page 19.

5.1 Locking/Unlocking the Floorstand Model

Enabling access to the accessible drives/HDD box

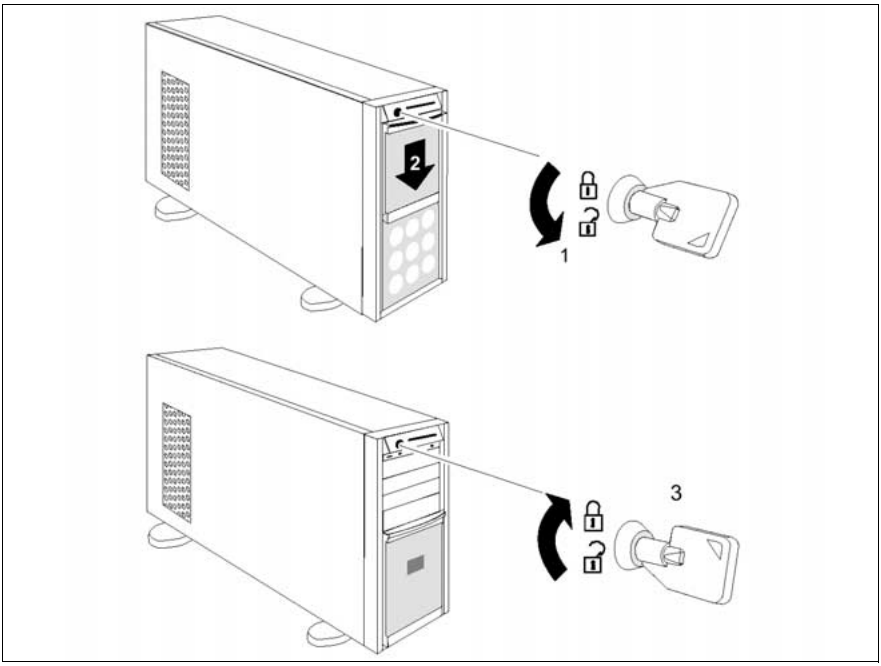

Figure 21: Accessing the accessible drives/HDD box

- Unlock the server (1).
- Slide the drive cover downwards (2).

To prevent access to the HDD modules, the server can be locked again (3). In this case, the drive cover cannot be pushed into the top position and the hard disk drive cover cannot be removed (see figure 22 on page 58).

Enabling access to the HDD modules

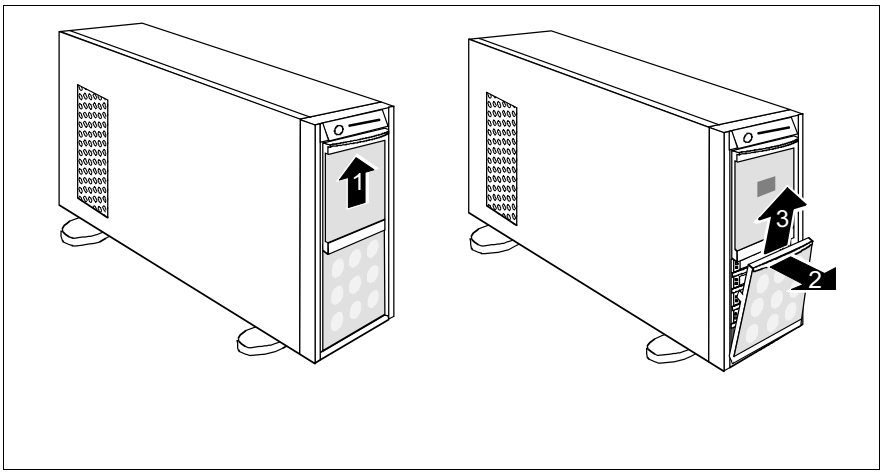

Figure 22: Accessing the HDD modules

- ► Unlock the server and remove the key.
- ► Slide up the drive cover as far as possible (1).
- ► Remove the hard disk drive cover (2 + 3).

The hard disk drive cover is replaced and the server locked in the reverse order.

5.2 Operating and Indicator Elements

5.2.1 The Front

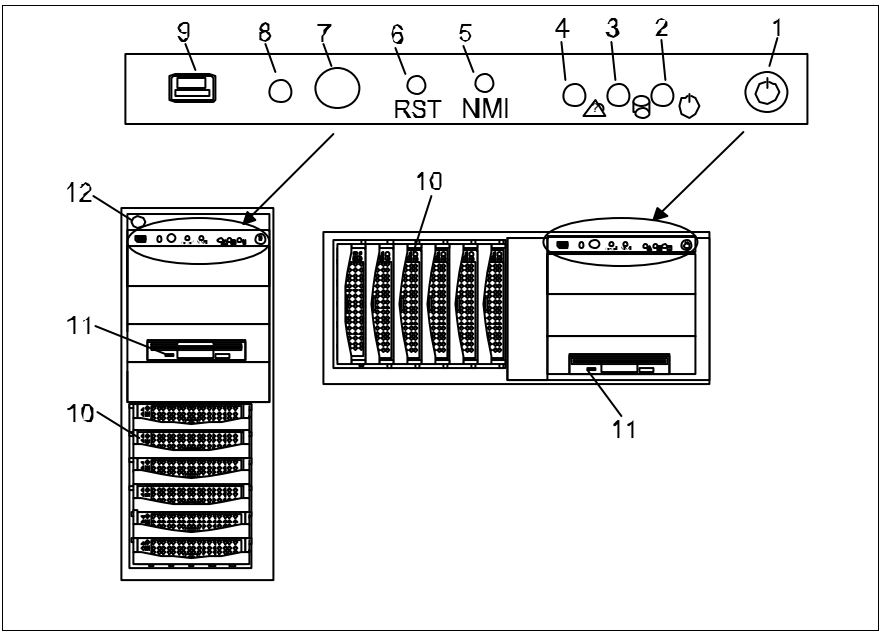

Figure 23: The front

1	ON/OFF button	7	ID button
2	Power-on indicator	8	ID indicator
3	Drive access indicator	9	USB port
4	Global Error indicator	10	Hard disk drive control indicators (figure 25)
5	NMI button	11	Floppy disk drive access indicator
6	Reset button	12	Key lock (floorstand model only)

Operating elements

Lock

The server can be locked to prevent access to the drives.

Server unlocked: the drives can be accessed.

Server locked: the drives can not be accessed.

ON/OFF button

When the system is switched OFF, it can be switched ON again by pressing the ON/OFF button. When the system is operating, pressing the ON/OFF button will switch OFF the system.

The ON/OFF button does not disconnect the server from the mains. To disconnect from the mains completely, switch OFF the mains power switch (if available on the standard PSU) and remove the power plug(s).

NMI NMI button

CAUTION!

Please do not press! Risk of losing data!

The NMI button may only be used by Service.

RST Reset button

Pressing the reset button reboots the system.

CAUTION!

Risk of losing data!

ID Identification (ID) button

The ID indicators on the front and on the rear of the server lights up (blue) when the ID button is pressed. The two ID indicators are synchronized.

Indicators on the control panel

Power-on indicator (bicolor)

Lights green when the server is switched ON.

Lights orange when the server is switched OFF, but mains voltage is present (standby mode).

Drive access indicator (green)

An internal SCSI drive (HDD or backup drive) is being accessed.

Global Error indicator

Does not light when the system is ok. The power is ON, no service incident or event has occurred.

Flashes orange when a critical event has occurred. Users can check BIOS Setup, system- and eventlog or via *ServerView* for event details.

Lights orange when a prefailure event has been recognized. Users can check system- and eventlog or via *ServerView* for event details.

If the event is still acute after a power failure, the indicator is activated after the restart.

ID ID indicator (blue)

Lights blue when the system has been selected by pressing the ID button. To deactivate, press the button again.

The ID indicator can also be activated via *ServerView* and its status reported to *ServerView*.

Indicators on the drives

CD-ROM/DVD-ROM indicator (option)

Lights green when the storage medium is being accessed.

Floppy disk drive indicator

Lights green when the storage medium is being accessed.

Indicators on the optional hot-plug tape drive

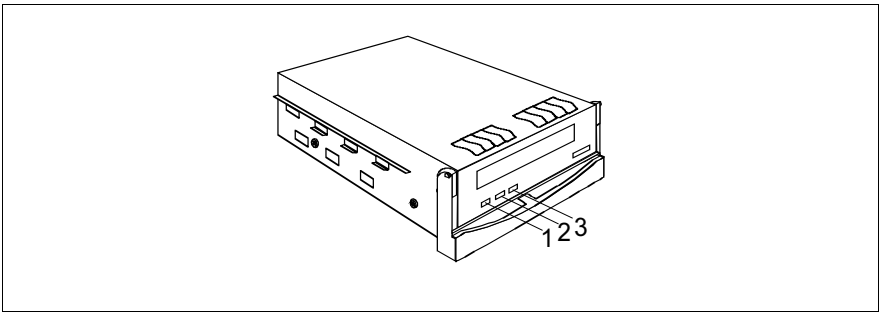

Figure 24: Hot-plug tape drive

1	Clean indicator
2	Media indicator
3	Drive indicator

Hard disk drive indicators

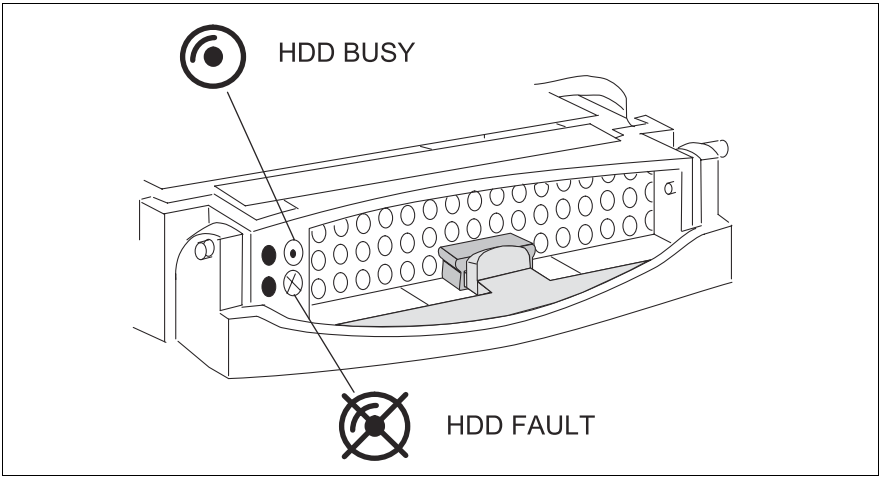

Figure 25: HDD module: indicators

LED green	HDD BUSY – lights: HDD in active phase – does not light: HDD inactive
LED orange	HDD FAULT (in conjunction with a RAID controller) – does not light: No HDD Error – lights: HDD Faulty or Rebuild Stopped (drive defective/needs replacing, a rebuild process was stopped or the HDD module is not correctly inserted) – slow blink: HDD Rebuild (the data is restored by the RAID controller after changing a hard disk drive) – fast blink: HDD Identify – four fast blinks/pause: HDD Predicted Fault – two fast blinks/pause: HDD Hot Spare (Hot spare drive active. The corresponding drive has failed).

5.2.2 The Rear Side

Indicators on the connection panel

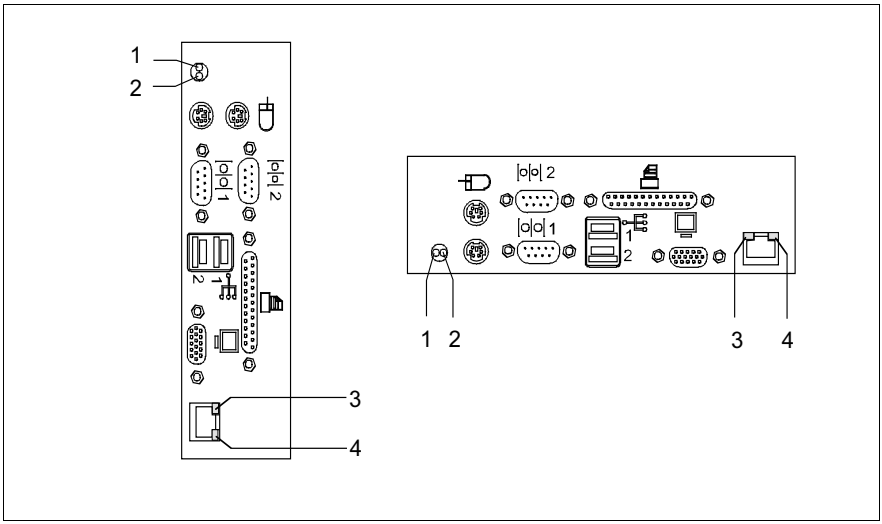

Figure 26: Connection panel: indicators

1	Global Error indicator (orange) Does not light when the system is ok. The power is ON, no service incident or event has occurred. Flashes orange when a critical event has occurred. Users can check BIOS Setup, system- and eventlog or via *ServerView* for event details. Lights orange when a prefailure event has been recognized. Users can check system- and eventlog or via *ServerView* for event details. If the event is still acute after a power failure, the indicator is activated after the restart.

2	ID indicator (blue) Lights blue when the system has been selected by pressing the ID button on the front. To deactivate, press the button again. The ID indicator on the front also lights up at the same time. The two ID indicators are synchronized. The ID indicator can also be activated via *ServerView* and its status reported to *ServerView*.
3	LAN transfer rate indicator (bicolor) Lights orange for a LAN transfer rate of 1 Gbps. Lights green for a LAN transfer rate of 100 Mbps. Does not light for a LAN transfer rate of 10 Mbps (or if there is no LAN connection available).
4	LAN link/active indicator (green) Lights green when a LAN connection is available. Does not light when there is no LAN connection available. Flashes green when a LAN transfer occurs.

Indicators on hot-plug power supply unit

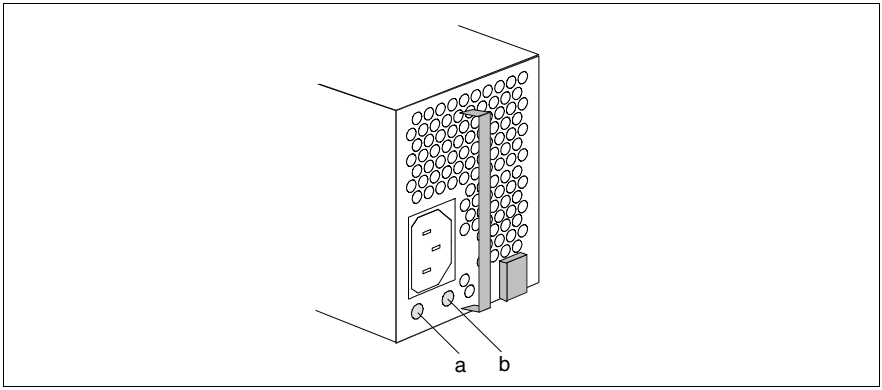

Figure 27: Hot-plug power supply unit

LED		Color	State	Meaning
a	Operation	orange	ON	Line Voltage OK (standby mode)
		green	ON	Server operating
b	Diagnosis	orange	ON	PSU prefailure
			ON/OFF	PSU fail

Main Power Switch (standard PSU)

If a main power switch is available on on the standard PSU, this switch OFF the server completely.

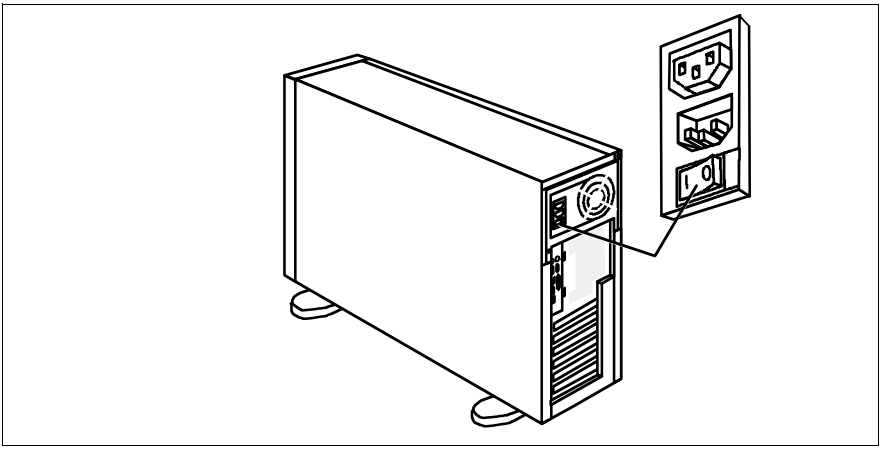

Figure 28: Main power switch

The main power switch (if available) disconnect the server from the mains. To disconnect the line voltage completely, remove the power plug.

5.3 Switching the Server ON and OFF

CAUTION!

If after switching ON the server there is nothing but flickering stripes on the screen, switch the server OFF immediately (see chapter “Trouble-shooting and Tips” on page 75).

The ON/OFF button does not disconnect the server from the mains. To disconnect from the mains completely, switch OFF the mains power switch (if available on the standard PSU) and remove the power plug(s).

Switching the server ON

– **First system installation:**

► Press the ON/OFF button (position 1in figure 23 on page 59).

► Insert the *ServerStart*-CD and/or an installation disk in the corresponding drive.

► Follow the instructions on the monitor (see also section “Configuration with ServerStart” on page 70 and/or section “Configuration without ServerStart” on page 71).

– **System already installed**:

The power-on indicator (position 2in figure 23 on page 59) lights orange (standby mode).

► Press the ON/OFF button (position 1in figure 23 on page 59).

The server is switched ON, performs a system test and boots the operating system.

Switching the server OFF

The power-on indicator (position 2in figure 23 on page 59) lights green.

► Shut down the operating system in an orderly manner.

► Press the ON/OFF button (position 1in figure 23 on page 59). and/or send a corresponding control signal (see „Other ON/OFF options„).

If the server fails to shut down keep the ON/OFF button pressed for at least four seconds.

Other ON/OFF options

In addition to the ON/OFF button, the server can be switched ON and OFF in the following ways:

– Specified **switch-on time/switch-off time**

  The server is switched ON or OFF at a time specified in the *ServerView* program.

– **Ring indicator**

  The server is switched ON via an internal or external modem.

– **Wakeup On LAN (WOL)**

  The server is switched on by a command via the LAN (Magic Package).

– **After power failure**

  The server automatically reboots following a power failure (depending of the settings in the BIOS).

5.4 Configuring the Server

This section contains information about configuring the server and installing the operating system.

Make sure that the energy saving functions are disabled in the *BIOS Setup* during server operation.

5.4.1 Configuration with ServerStart

Configuring IME (RAID Level 1)

The server is equipped with an onboard Ultra320 SCSI controller with Integrated Mirroring Enhanced functionality. Configure IME **before** you begin with *ServerStart*.

To configure Integrated Mirroring Enhanced the controller has its own RAID-Select Utility. For further information see “Integrated Mirroring User’s Guide“ on the *ServerBooks* CD (choose *Controllers* from the menu).

With the *ServerStart*-CD provided, you can configure the server and install the operating system in a convenient manner. The menu-guided configuration includes the server configuration with the *SCU* and the RAID controller configuration with the *GAM* (Global Array Manager) and/or Adaptec Storage Manager.

Descriptions of operating systems not covered in the RAID controller manual are provided in the appropriate readme files on the driver diskettes.

To find out how to operate *ServerStart* and for further information, refer to the corresponding CD booklet (see “Related Publications” on page 103).

If you use *ServerStart*, you can skip the following section on how to configure the server and install the operating system. Continue with section “Cleaning the Server” on page 72.

5.4.2 Configuration without ServerStart

Configuring IME (RAID Level 1)

The server is equipped with an onboard Ultra320 SCSI controller with Integrated Mirroring Enhanced functionality.

To configure Integrated Mirroring Enhanced the controller has its own RAID-Select Utility. For further information see " Integrated Mirroring User's Guide" on the *ServerBooks* CD (choose *Controllers* from the menu).

Configuring the PCI RAID controller

If your server is fitted with a RAID controller, you must configure it as described in the related documentation.

Configuring the onboard SCSI controller

You will find a description of the onboard SCSI controller configuration in the Technical Manual for the system board (see "Related Publications" on page 103). Further information is available on the driver diskettes provided.

Installing the operating system

- Insert the installation floppy disk and the CD for the operating system you want to install.
- Reboot the server.
- Follow the instructions on the screen and in the manual for the operating system.

If your server is equipped with a RAID controller, please read how to install the desired operating system in the related manual.

5.5 Cleaning the Server

CAUTION!

Switch the server off and pull the power plug out of the grounded-contact power socket.

Do not clean any interior parts yourself; leave this job to a service technician.

Do not use any cleaning agents that contain abrasives or may corrode plastic.

Ensure that no liquid enters the system. Ensure that the ventilation areas of the server and the monitor are clear.

Clean the keyboard and the mouse with a disinfecting cloth.

Wipe the server and monitor casing with a dry cloth. If particularly dirty, use a cloth that has been moistened in a mild domestic detergent and then carefully wrung out.

6 Property and Data Protection

The floorstand model is protected against unauthorized opening with the lock. The server is also fitted with an intrusion detection switch which enables the *ServerView* programme to detect and log any removal of the left cover or housing cover and the cover for the HDD modules.

To prevent it being removed from its location, the floorstand model can be secured to a fixed object with a steel cable run through the tab on the back.

The rack model is protected against unauthorized access by means of a lockable rack door.

To protect your system and data internally against unauthorized access, you can use the *BIOS Setup* security functions.

6.1 BIOS Setup Security Functions

The *Security* menu in *BIOS Setup* offers you various options for protecting your data from unauthorized access. By combining these options you can achieve optimum protection for your system.

You will find a detailed description of the *Security* menu and how to assign passwords in the manual for the *BIOS Setup* and on the ServerBooks CD (see also “Related Publications” on page 103).

Preventing unauthorized BIOS Setup calls

You can activate this protection by entering a setup password in the *Security* menu. In addition, you can suppress the `Press F2 for Setup` message in the Security menu. This message is then no longer displayed while the server's startup routine is in progress.

Preventing unauthorized system access

You can activate this protection by entering a system password in the *Security* menu.

Preventing unauthorized access to the boards with their own BIOS

You can activate this protection by selecting the value *Extended* for the *Setup Password Lock* field in the *Security* menu.

Preventing the system from booting from the floppy disk drive

You can activate this protection by selecting the value *Diskette Lock* for the *System Load* field in the *Security* menu.

Preventing unauthorized writings of floppy disks

To activate this protection, select the value *Disabled* for the *Diskette Write* field in the *Security* menu.

Protecting BIOS from being overwritten

To activate this protection, select the value *Disabled* for the *Flash Write* field in the *Security* menu.

Protecting the server from being switched on by an external device

To activate this protection select the value *Disabled* for the *Remote Power On* field in the *Security* menu.

Protecting the server from being switched off by a program

To activate this protection select the value *Disabled* for the *Soft Power Off* field in the *Security* menu.

7 Troubleshooting and Tips

CAUTION!

Observe the safety information in the „Security“ manual and in chapter “Hardware Installation” on page 31.

If a problem occurs, try to resolve it as described:

– in this chapter,
– in the documentation for the attached devices,
– in the help systems of the software used.

If you fail to correct the problem, proceed as follows:

► Make a list of the steps and the circumstances that led to the fault. Also make a list of any error messages that were displayed.

► Switch off the server.

► Contact our customer service team.

7.1 Power-On Indicator Remains Dark

The power-on indicator remains dark after switching ON.

Power cord incorrectly connected

► Make sure that the power cable(s) is correctly connected to the server and to the grounded socket(s).

Power supply overloaded

► Pull the server power plug(s) out of the power socket(s).

► Wait a few seconds before you plug it(s) into the grounded socket(s) again.

► Switch on your server.

7.2 The Server switches itself OFF

Server Management has detected an error

- Check the error list or the ErrorLog file in the *ServerView* program, and attempt to eliminate the error.

7.3 The Monitor Remains Dark

Monitor is switched OFF

- Switch on your monitor.

Screen has gone blank

- Press any key on the keyboard.

  or

- Deactivate screen blanking (screen saver). Enter the appropriate password.

Brightness control is set to dark

- Set the brightness control on the monitor to light. For detailed information, please refer to the Operating Manual supplied with your monitor.

Power cable or monitor cable not connected

- Switch off the monitor and the server.
- Check whether the power cable is properly connected to the monitor and to the grounded socket.
- Check whether the monitor cable is properly connected to the server and monitor (if it is plugged in with a connector). If a separate graphics card is installed in the server, then the monitor cable must be connected to the graphics card.
- Switch on the monitor and the server.

7.4 Flickering Stripes Across the Monitor

CAUTION!

Switch off the server immediately. Risk of damaging the server.

Monitor does not support the set horizontal frequency

- ► Find out which horizontal frequency your monitor screen supports. You will find the horizontal frequency (also known as line frequency or horizontal deflection frequency) in the documentation for your monitor.
- ► Refer to the documentation for your operating system or corresponding software for the screen controller for how to set the correct horizontal frequency for your monitor, and follow the procedure accordingly.

7.5 No Monitor Display or the Display Drifts

The wrong horizontal frequency or resolution has been selected for the monitor or for the application program.

- ► Find out which horizontal frequency your monitor screen supports. You will find the horizontal frequency (also known as line frequency or horizontal deflection frequency) in the documentation for your monitor.
- ► Refer to the documentation for your operating system or corresponding software for the screen controller for how to set the correct horizontal frequency for your monitor, and follow the procedure accordingly.

7.6 No Mouse Pointer Displayed on the Monitor

Mouse driver not loaded

- ► Check whether the mouse driver is properly installed and is present when the application program is started. Detailed information can be found in the user manuals for the mouse, the operating system or the application program.

Mouse controller disabled

The mouse controller on the system board must be enabled if you use the supplied mouse.

- Check in the *BIOS Setup* that the mouse controller is *Enabled*.

7.7 The Floppy Disk Cannot be Read or Written

- Check whether the write protection for the floppy disk is activated.
- Check the entry for the floppy disk drive in the *BIOS Setup*.
- Check in the *BIOS Setup* whether the floppy disk drive controller and write permission are enabled (see technical manual for system board on the PRIMERGY ServerBooks CD).

7.8 Incorrect Time and/or Date

- Set the time and/or date in the operating system or in *BIOS Setup*.

If the time and date are repeatedly wrong when you switch on your server, you must change the lithium battery. Contact our Service group.

7.9 System Fails to Boot

The system will not boot after installing a new hard disk drive.

Incorrect SCSI configuration (Ultra Wide SCSI Controller)

- In the SCSI configuration menu check the settings for the hard disk drives (*SCSI Device Configuration*) and the settings under *Advanced Configuration Options*.

7.10 Drives Are Reported as „Dead“

This error message may occur when the server has a RAID controller:

RAID controller configuration incorrect

► Check and correct the settings for the drives with the RAID controller utility.

Further information is provided in the manual on the RAID controller.

7.11 Added Drive Reported Defective

This error message may occur when the server has a RAID controller:

RAID controller is not configured for this hard disk drive

The drive was probably installed when the system was switched off.

► Reconfigure the RAID controller for the drive with the corresponding utility. Information is contained in the documentation on the RAID controller.

or

► Reinstall the drive while the system is switched ON.

If the hard disk drive continues to be shown as defective, then replace it (see section “Installing/Removing HDD Module” on page 85).

7.12 Error Messages on the Monitor

The meanings of the error messages are explained in the manual for the *BIOS Setup* and in the documentation for the relevant components and programs on the PRIMERGY ServerBooks CD.

8 Hot-plug Components

This chapter describes how to handle hot-plug components and/or how to modify your server hardware.

The hot-swap (online replacement) procedure increases the availability of the system operation and guarantees a high degree of data integrity and fail-safe performance.

Upgrades or replacements of permanently installed components are described in the Options Guide and/or in the Service Supplement and may only be performed by Service staff.

8.1 Hot-plug Power Supply Units

The fixed power supply unit can optionally be replaced with one or two hot-plug power supply units. The upgrading may only be performed by service personnel.

If two hot-plug power supply units are installed, if one power supply unit fails, the other unit ensures operation can continue uninterrupted. The defective power supply unit can be replaced online.

CAUTION!

Please observe the safety information in chapter “Important Notes” on page 19.

8.1.1 Replacing a Hot-plug Power Supply Unit

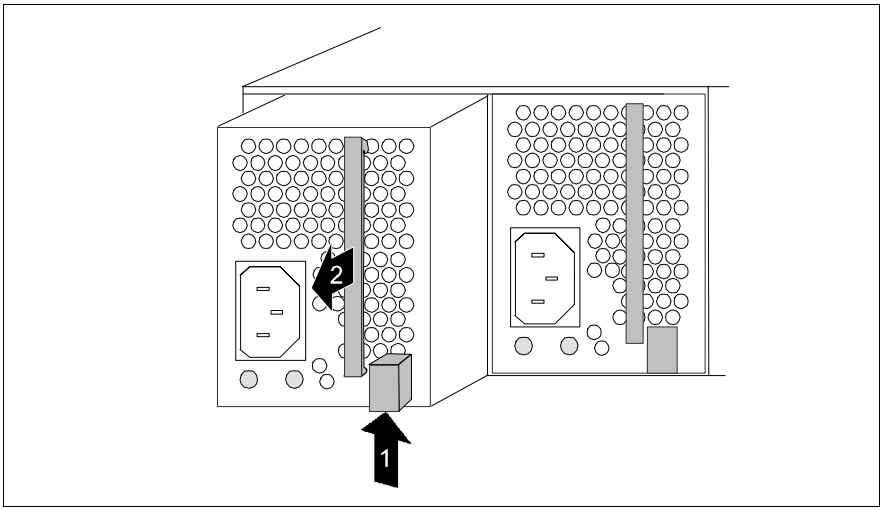

Figure 29: Unlocking and removing the power supply unit

CAUTION!

Before replacing a **non defective** hot-plug power supply unit in a non-redundant configuration (only one power supply unit present) the server **must** be switched OFF.

- ► Remove the cable from the installed power supply unit.
- ► Push the transport look (green latch) in the direction of the arrow (1) and pull the power supply unit out of the location (2).
- ► Insert the new power supply unit into the free mounting location until it clicks into position.

  Make sure that the power supply unit engages correctly in the mounting frame and is locked in position.

  This is the only way to avoid the power supply unit being shaken out of its mountings and damaged during transport.
- ► Connect up the power supply unit.

8.2 Hot-plug Hard Disk Drives

Up to six Ultra 3-Wide U320-SCSI hard disk drives can be installed in the PRIMERGY TX200 S2 server.

The hard disk drives are mounted on a carrier that allows defective drives to be replaced (hot-swap) or new drives to be added online. The hard disk drive and the carrier constitute the hard disk drive module (HDD module).

The hot-swap function (online replacement) can only be performed if the RAID is configured appropriately. Further information about the RAID configuration or RAID level can be found in the RAID controller documentation.

When replacing a HDD module, refer to “Hard disk drive indicators” on page 63 as well as section “Hot-swap for HDD Modules” on page 89.

8.2.1 Handling Hard Disk Drives/HDD Modules

Hard disk drives incorporated in the HDD modules are highly sensitive electromagnetic devices and must be handled with great care. It is extremely likely that incorrect handling will lead to partial and/or total failure of the hard disk drives. These failures will result in data errors and to loss of data or to total corruption of the hard disk drive.

Please observe the following rules, which will help avoid such problems occurring:

- Store and transport HDD modules only within the limits stipulated in the specification.
- When transporting HDD modules (even over short distances), always use the original packaging (ESD labeling).
- Never expose a HDD module to a temperature shock. Avoid the formation of condensation inside and on the outside of the hard disk drive. The hard disk drives may only be exposed to defined temperature and climatic conditions.
- Always put the HDD module down carefully, with its largest surface facing downwards, to avoid the danger of tipping over.

8.2.2 Installing/Removing Dummy Module

Free slots are provided with a dummy module that must be removed before installing an additional HDD module.

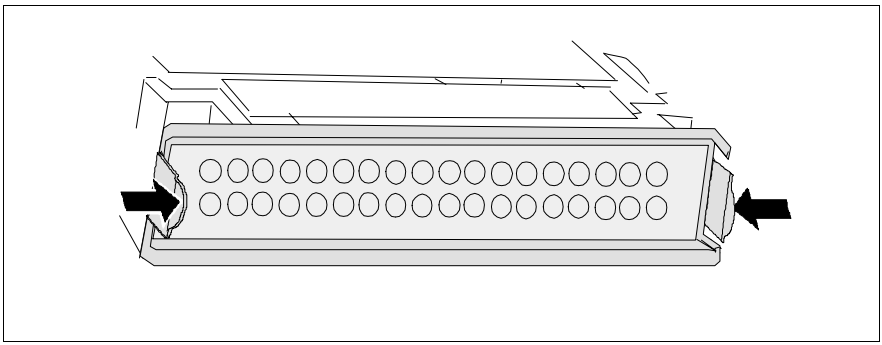

Figure 30: Removing dummy module

- Press the both tabs on the dummy module together until the locking mechanism disengages and remove the dummy module from the mounting location.

The dummy module is installed in the reverse order.

CAUTION!

Keep the dummy module for future use. If the HDD module is removed again and not replaced with a new module, the dummy module must be reinstalled due to cooling, to comply with applicable EMC regulations (regulations on electromagnetic compatibility) and to protect against fire.

8.2.3 Installing/Removing HDD Module

CAUTION!

Under no circumstances should you remove a HDD module while the system is in operation if you are not sure that the hard disk drive is operated by a RAID controller and belongs to a disk array that is operating in RAID level 1,5 or 10.

CAUTION!

The HDD module must be acclimatized in its operating environment for an acclimatization time (table 3).

Temperature difference (°C) (operating environment/outside temperature)	Minimum acclimatization time (hours)
5	3
10	5
15	7
20	8
25	9
30	10

Table 3: Acclimatization time for the HDD module

CAUTION!

The HDD modules must be marked clearly (see position 5 in figure 31 on page 86) so that they can be put back into their original place after an upgrade. If this is not taken into account, existing data can be destroyed.

So that the storage capacity of the hard disk can be recognized at a glance when the hard disk drive is replaced, several prefabricated stickers with the storage capacities are provided with the server. Each HDD module should bear a sticker indicating its capacity on the front (position 5 in figure 31 on page 86). Should no suitable sticker be available, blank stickers for labeling are also provided. The stickers are available in several colors to facilitate identification.

The hard disk drives that can be ordered for the PRIMERGY TX200 S2 are delivered as HDD modules, with the hard disk drives preinstalled on carriers. The hard disk drive may only be removed from the carrier by personnel with the appropriate technical training in compliance with the appropriate ESD guidelines (see section “Modules with electrostatic-sensitive components” on page 24).

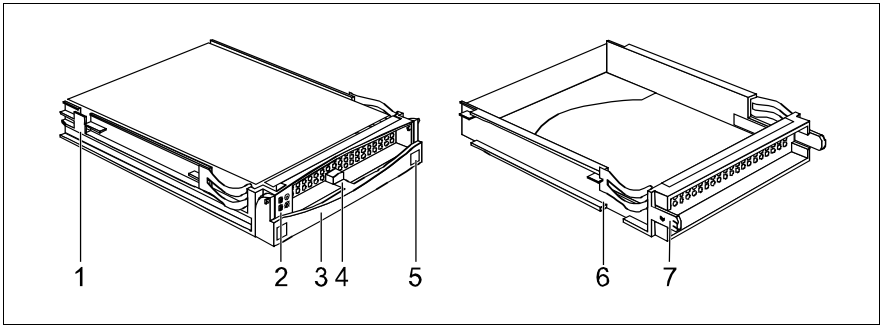

Figure 31: HDD module and dummy cover

1	HDD module (hard disk drive carrier with installed hard disk drive)
2	Indicators HDD busy (LED green HDD fault (LED orange) Description see table on page 63 in section „Hard disk drive indicators“.
3	Handle for locking and unlocking of the hard disk drive module
4	Locking button
5	Ridge for the application of a sticker with the current drive identifier
6	Dummy module
7	Locking tabs

Unlocking the HDD module

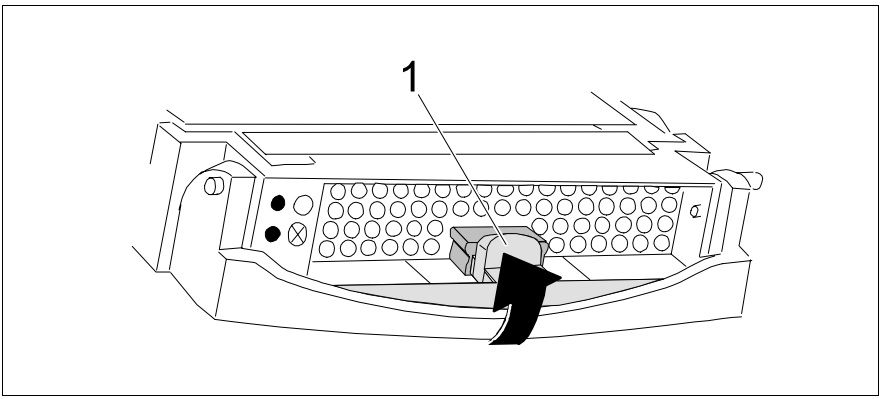

Figure 32: Unlocking HDD module

- ► Open the locking mechanism by pressing the locking button (1).
- ► Push the handle of the HDD module fully in the direction of the arrow.

If the HDD modules are provided with a transport lock (1 in the next figure) remove these before you open the locking mechanism.

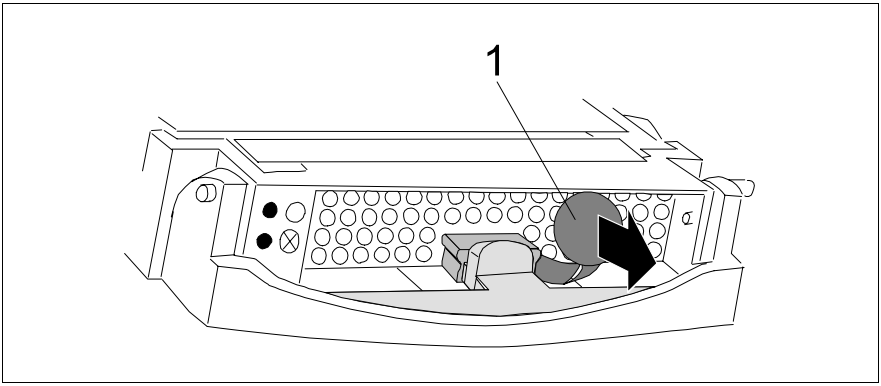

Figure 33: HDD module: removing the transport lock

Installing the HDD module

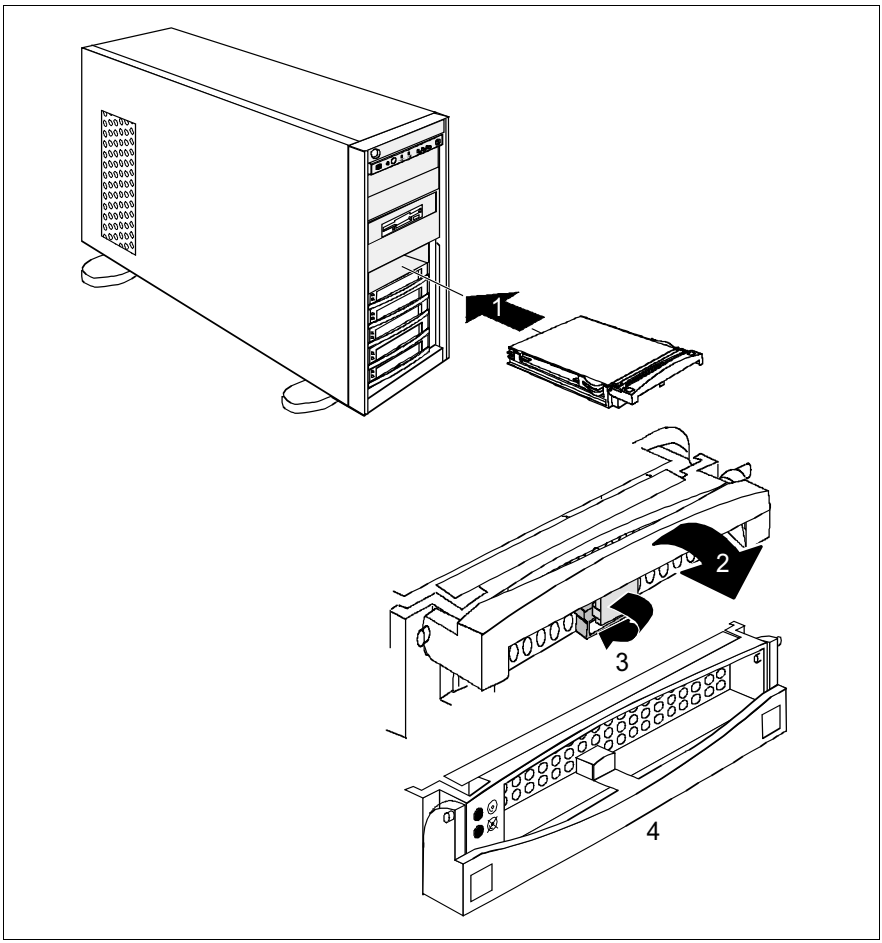

Figure 34: Installing the HDD module

- ► Unlock the HDD module as described in “Unlocking the HDD module” on page 87.
- ► Carefully push the HDD module into the empty slot (1) until it stops.
- ► Push the handle completely in the direction of the arrow (2) until the locking mechanism (3) engages (4).

To remove the drive, follow the same procedure in the reverse order.

8.2.4 Hot-swap for HDD Modules

CAUTION!

The hot-swap function (online replacement) can only be performed if the RAID is configured appropriately.

Only remove a HDD module during operation if the drive is not being accessed. Observe the control LEDs for the corresponding HDD module (see “Hard disk drive indicators” on page 63).

If you want to replace a HDD module during operation, proceed as follows:

- If you want to remove a HDD module that is not defective, the drive must be first set to offline via the software (RAID controller configuration software).
- Now pull out the HDD module a few centimeters.
- Wait for at least 60 seconds.

  This period is necessary for the RAID controller to recognize that a HDD module has been pulled out and for the hard disk drive to come to a stop.
- Pull out the HDD module fully.
- Insert the new HDD module.

If you remove a HDD module and do not replace it with a new module, insert a dummy module into the empty mounting location. Ensure that the dummy module engages correctly in the mounting location.

8.3 Installing/Removing a Hot-plug Magnetic Tape Drive

A hot-plug tape drive can be installed optionally in the drive cage or in the HDD extension box. Two mounting locations are occupied as a result in the drive cage or in the HDD extension box, which are then no longer available for HDD modules. This magnetic tape drive can be replaced online (hot-swap).

CAUTION!

Please observe the safety information in chapter “Important Notes” on page 19.

The optional hot-plug magnetic tape drive may only be installed in the two top or right-hand mounting locations in the drive cage or HDD extension box. The dummy modules installed in each of the slots should be removed.

- Remove the dummy modules from the two slots (see section “Installing/Removing HDD Module” on page 85).

CAUTION!

Keep the dummy modules. If the drive is removed and not replaced with a new drive, the dummy module must be reinstalled due to cooling, to comply with applicable EMC regulations (regulations on electromagnetic compatibility) and to protect against fire.

The hot-swap magnetic tape drives that can be ordered for the PRIMERGY TX200 S2 are delivered preinstalled on carriers. The magnetic tape drive may only be removed from the carrier by personnel with the appropriate technical training in compliance with the appropriate ESD guidelines (see section “Modules with electrostatic-sensitive components” on page 24).

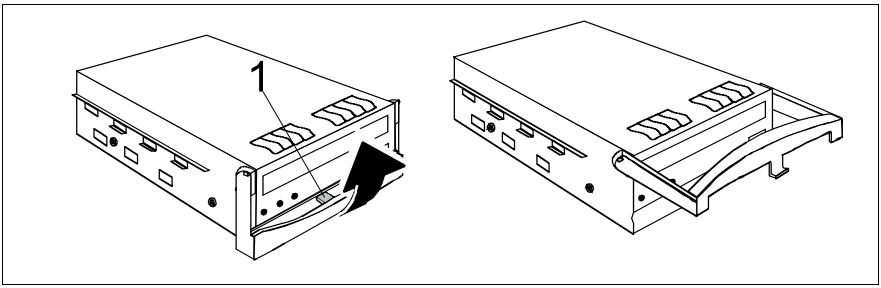

Figure 35: Unlocking the hot-plug magnetic tape drive

- ► Open the locking mechanism by pressing the locking button (1).
- ► Push the handle of the module fully in the direction of the arrow.

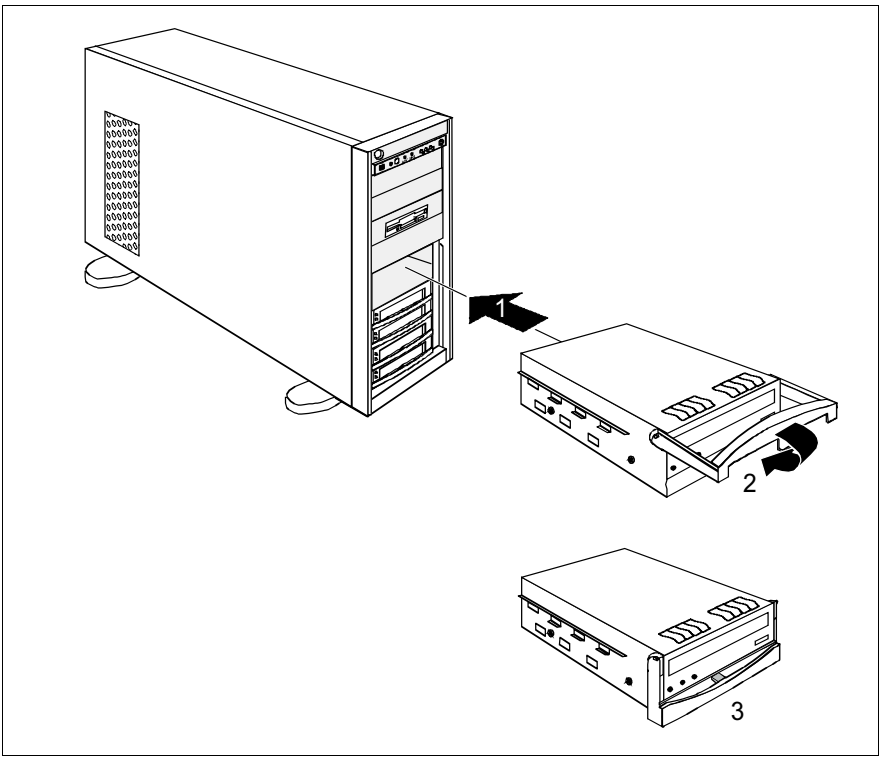

Figure 36: Installing a hot-plug magnetic tape drive

- ► Carefully push the drive into the empty mounting location (1) until it stops.
- ► Push the handle completely in the direction of the arrow (2) until the locking mechanism engages (3).

To remove the drive, follow the same procedure in the reverse order.

8.4 Replacing a Hot-plug CPU/System Fan

The server is at least equipped with one CPU fan unit (one hot-plug fan for each CPU) and with two system fans. The server can optionally be upgraded with two additional system fans.

CAUTION!

The actions described in this section may only be performed by personnel with the appropriate technical training. (Any unauthorized openings and improper repairs could damage the equipment.)

Please observe the safety information in chapter “Important Notes” on page 19.

In order to replace a defective fan, the left side cover (floorstand model) or the housing cover (rack model) must be removed as the fans are not directly accessible (see section “Opening/Closing the Housing” on page 94).

If only two system fans are installed (no redundancy), a defective fan must be replaced immediately. If four system fans are installed, the fans are operating in a redundant configuration. A defective system fan can be replaced during the next service. A defective CPU fan must be replaced immediately.

The failure of a system fan is notified by the Global Error indicator on the front and rear of the server (flashes orange).

The LED on the appropriate fan shows which fan has failed. The LEDs are only visible if the server housing is opened.

- ► Remove the left side cover (floorstand model) or the housing cover (rack model) (see section “Opening/Closing the Housing” on page 94).

CAUTION!

The left side/housing cover must be replaced as fast as possible due to cooling, to comply with applicable EMC regulations (regulations on electromagnetic compatibility) and to protect against fire. the maximum opening time of the housing cover amounts to 60 minutes.

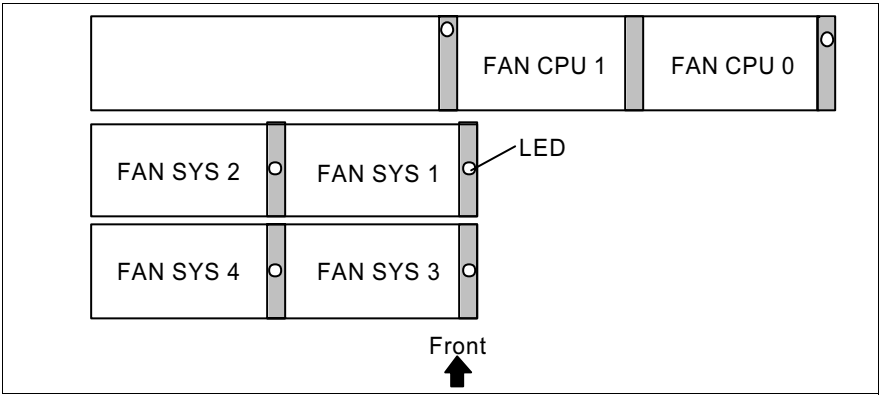

Figure 37: Arrangement of the system fans

► Identify which fan is defective (LED does not light).

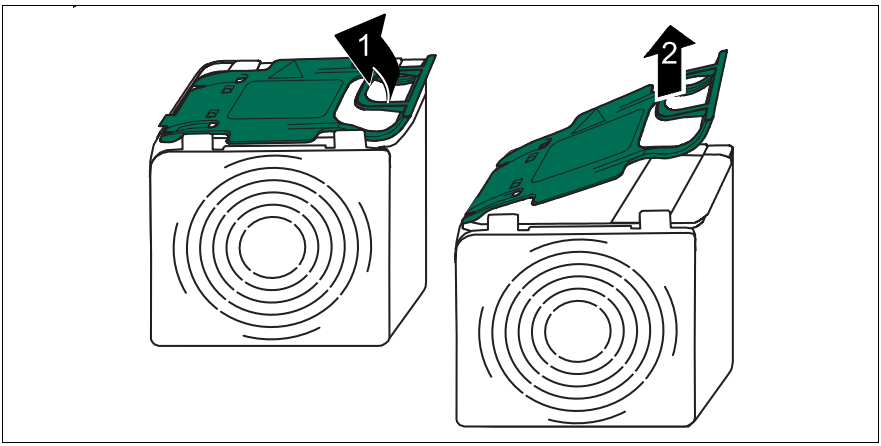

Figure 38: Removing a system fan

► Pull the green handle in the direction of the arrow (1) and disengage the locking mechanism.

► Remove the fan from the cartridge (2).

► Place the removed fan away from the server.

CAUTION!

Never place the removed/defective fan within the server, thus preventing a short circuit.

► Pull the green handle of the new fan, insert the fan into the fan cartridge and push the handle into position to engage the locking mechanism.

The new system fan is tested by Server Management. The relevant LED then lights green (fan is working) or does not light (fan is not working).

► Replace the left side cover (floorstand model) or the housing cover (rack model) (see section “Opening/Closing the Housing” on page 94).

8.5 Opening/Closing the Housing

CAUTION!

Any unauthorized openings and improper repairs could damage the equipment.

Please observe the safety information in chapter “Important Notes” on page 19.

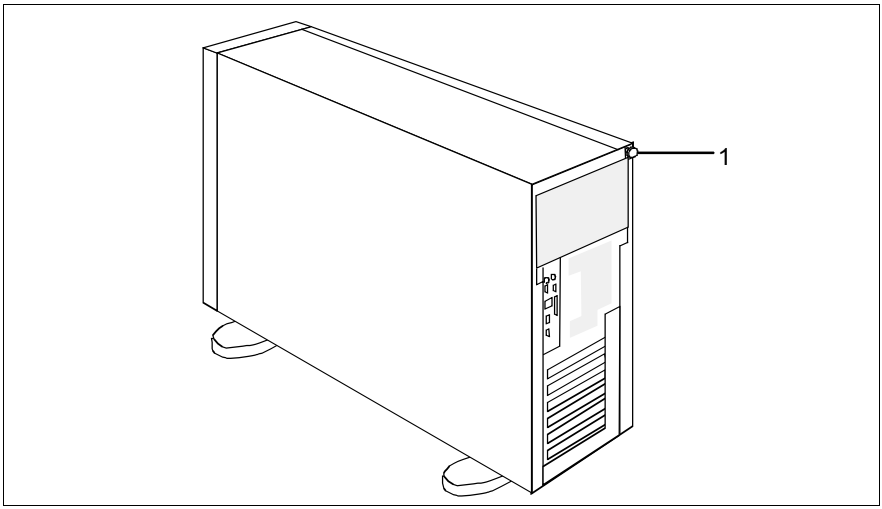

Figure 39: Opening the housing

► Open the green knurled screw (1) on the rear of the server.

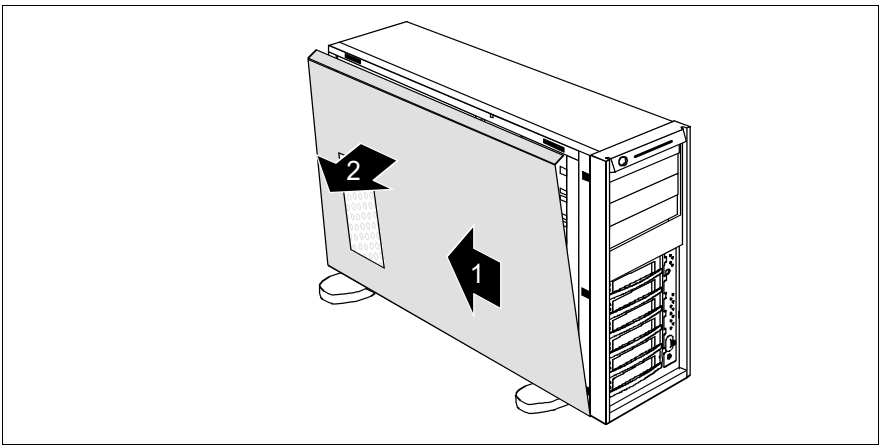

Figure 40: Removing the side cover

- ► Push the left side cover approx. 2 cm in the direction of the arrow (1).
- ► Remove the side cover (2).

The cover is replaced in the reverse order.

Abbreviations

AC
Alternating Current

ANSI
American National Standard Institut

ASR&R
Automatic Server Reconfiguration and Restart

BIOS
Basic Input-Output System

BMC
Baseboard Management Controller

CC
Cache Coherency

CD
Compact Disk

CD-ROM
Compact Disk-Read Only Memory

CHS
Cylinder Head Sector

CMOS
Complementary Metal Oxide Semiconductor

COM
Communication

CPU
Central Processing Unit

DC
Direct Current

DIMM
Dual Inline Memory Module

DIP
Dual Inline Package

DMA
Direct Memory Access

DMI
Desktop Management Interface

ECC
Errror Checking and Correcting

ECP
Extended Capabilities Port

EEPROM
Electrically Erasable Programmable Read-Only Memory

EMC
ElectroMagnetic Compatibility)

EMP
Emergency Management Port

EPP
Enhanced Parallel Port

ESD
ElectroStatic Discharge

FPC
Front Panel Controller

FRU
Field Replaceable Unit

FSB
Front Side Bus

GAM
Global Array Manager

GUI
Graphical User Interface

HDD
Hard Disk Drive

HSC
Hot-Swap Controller

I²C
Inter-Integrated Circuit

I/O
Input/Output

ICM
Intelligent Chassis Management

ID
Identification

IDE
Intergrated Drive Electronics

IME
Intergrated Mirroring Enhanced

IRQ
Interrupt Request Line

LAN
Local Area Network

LBA
Logical Block Address

LCD
Liquid Crystal Display

LUN
Logical Unit Number

LVD
Low-Voltage Differential SCSI

MMF
Multi Mode Faser

MRL
Manually Retention Latch

NMI
Non Maskable Interrupt

NVRAM
Non Volatile Random Access Memory

OS
Operating System

PCI
Peripheral Component Interconnect

PDA
Prefailure Detection and Analysing

POST
Power ON Self Test

RAID
Redundant Arrays of Independent Disks

RAM
Random Access Memory

ROM
Read-Only Memory

RSB
Remote Service Board

RTC
Real Time Clock

RTDS
Remote Test- und Diagnose-System

SAF-TE
SCSI Accessed Fault-Tolerance Enclosures

SBE
Single Bit Error

SCA
Single Connector Attachment

SCSI
Small Computer System Interface

SDDC
Single Device Data Correction

SDR
Sensor Data Record

SDRAM
Synchronous Dynamic Random Access Memory

SEL
System Event Log

SMI
System Management Interrupt

SSU
System Setup Utility

SVGA
Super Video Graphics Adapter

USB
Universal Serial Bus

VGA
Video Graphics Adapter

Related Publications

PRIMERGY manuals are available as PDF file on the ServerBooks CD. The **ServerBooks** CD is part of the **ServerStart Suite** delivered with each server system.

The actual version of the necessary manuals can be downloaded free of charge from the Internet. The overview page showing the online documentation available in the Internet can be found via the URL:
http://manuals.fujitsu-siemens.com (choose: *industry standard servers*).

[1] **Safety**

[2] **Warranty**

[3] **PRIMECENTER Rack**
Technical Manual

[4] **DataCenter Rack**
Technical Manual

[5] **19 Inch Rack**
Technical Manual

[6] **PRIMERGY ServerView Suite**
SrverStart

[7] **ServerView**
Server Management
User Manual

[8] **ServerView Extension**
ServerView Extension for HP OpenView NNM

[9] **ServerView/Plus for Tivoli**

[10] **RemoteView**
User Manual

[11] **RemoteView Service Board S2/S2 LP 1.x**
Mounting and Setting Up
User's Guide

[12] **PRIMERGY TX200 S2**
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[13] **System Board D1919**
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[14] **BIOS-Setup**
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[15] **Integrated Mirroring**
User's Guide

[16] **Global Array Manager Client Software**
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[17] **Global Array Manager Server Software**
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[18] **Configurator**
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